

SERVICE INFORMATION
PHYACTION GUIDANCE-E/GUIDANCE-C

Version 0.5 May 2002

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2. GENERAL INFORMATION

2.1 Introduction.

The Phyaction Guidance E/C is an advanced 2 channel appliance for electrotherapy, offering a wide range of current types which can be applied by means of normal electrodes or via the integrated vacuum unit.

Compared with the Guidance E, the Guidance C has an additional integrated ultrasound module.

As a member of the I.M.S group, it is built according to the newest requirements concerning the Medical Device Directive.

This manual is written for service engineers, who are authorized by GymnaUniphy nv.

It gives a complete and accurate picture of the Guidance E/C. In doing so, it will hopefully help you to reach your goal: to form a correct diagnosis and to solve the client's problem as thoroughly as possible.

2.2 Information.

If you require additional information, feel free to contact us.

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2.3 Safety aspects.

2.3.1 Electrical safety.

The equipment can only be used in areas with provisions in accordance with current statutory requirements. Pay particular attention to the use of protective earth, otherwise the patient leakage current can rise above the permitted limit for type BF equipment.

2.3.2 Explosion safety.

The equipment is not suitable for use in areas where flammable gasses or vapours are present. Therefore, remove the mains plug from the socket before the area in which the equipment is located is disinfected, since some disinfecting solutions evaporate and subsequently form an explosive mixture.

2.3.3 Operational safety.

- Using the equipment in the vicinity of short wave or microwave equipment can influence the output of the unit. Using this equipment when high frequency surgical equipment is connected to the patient at the same time can result in burning under the electrodes.
- Patients who have electrical implants (i.e. pacemaker) may only be treated following medical advice.
- The equipment is not suitable for use in damp areas.
- The equipment may not be disinfected or sterilised.
- The equipment contains a number of safety systems that operate independently of the microprocessor.

When the safety system detects a fault during electrotherapy the delivery of current is interrupted within a few milliseconds and it is impossible to perform treatment using the equipment. The safety of the patient is therefore guaranteed. Whenever the equipment is switched on (using the main switch) the microprocessor checks the entire safety system for correct operation.

2.3.4 Use of the appliance.

The equipment and accessories should only be used by authorised personnel and in accordance with all instructions included in these operating instructions. The Phyaction Guidance is only to be used for electrotherapy.

2.3.5 Product documentation.

We strongly recommend reading the Guidance Guideline carefully, in order to understand and solve questions of the end user.

2.3.6 Radio interference suppression and electromagnetic compatibility.

This equipment meets the guidelines for ISM equipment relating to electromagnetic compatibility and is radio interference suppressed according to VDE 0871-B. Also see paragraph 1.2.3 *Operational safety*, concerning the use of the equipment in the vicinity of short wave and microwave equipment.

2.3.7 Medical device directive (MDD)

This device complies with the essential requirements of the Medical Device Directive of the European Committee (93/42/CEE) as most recently changed.

2.4 Installation.

2.4.1 Incoming inspection.

Check that the equipment has not been damaged during transportation and that the accessories are intact and complete. In the event of damage and/or defect you should inform your supplier.

2.4.2 Mains voltage.

Your appliance can be run off the mains at a nominal voltage of 110, 115, 127, 220, 230 or 240 Volt AC, 50-60 Hz. On the bottom of the appliance, you will find the mains voltage selector³³ to set the correct mains voltage. Check if the voltage is selected correctly (setting of a lower value than the value which should be used in your region can lead to irreversible damage of the equipment). You can use a coin to turn the switch.

2.4.3 Functional test.

During production the equipment is tested for electrical safety. Whenever the equipment is switched on, the processor performs an extensive test to ensure that the equipment is operating correctly. In addition you must check whether the display and the indicator lamps are operating correctly. If this is not the case, then you must not use the equipment and you must contact your supplier.

If you can't read or if it is difficult to read the display, then press the system adjustment button 12 and select option contrast. Use the black ▲ button to darken the text or the black ▼ button if you want to make the text lighter.

2.4.4 Selecting the operating language.

You have the possibility to change the operating language by depressing system adjust button 12 and selecting the language option. You have the choice from various languages. Once selected, the equipment will use the language you have chosen.

2.4.5 Location and transportation.

The equipment must be set up horizontally and stable. You must ensure that the perforated sections on both sides of the casing are not covered up, thus hindering air circulation. Objects must not be placed on the equipment and you must ensure that no liquid enters the equipment. Empty the watercontainer of the vacuum part before transportation of the unit. Use the original packaging, if sending of the unit is necessary.

The appliance is capable, while packed for transport and storage, of being exposed for a period not exceeding 15 weeks to environmental conditions not outside the following ranges:

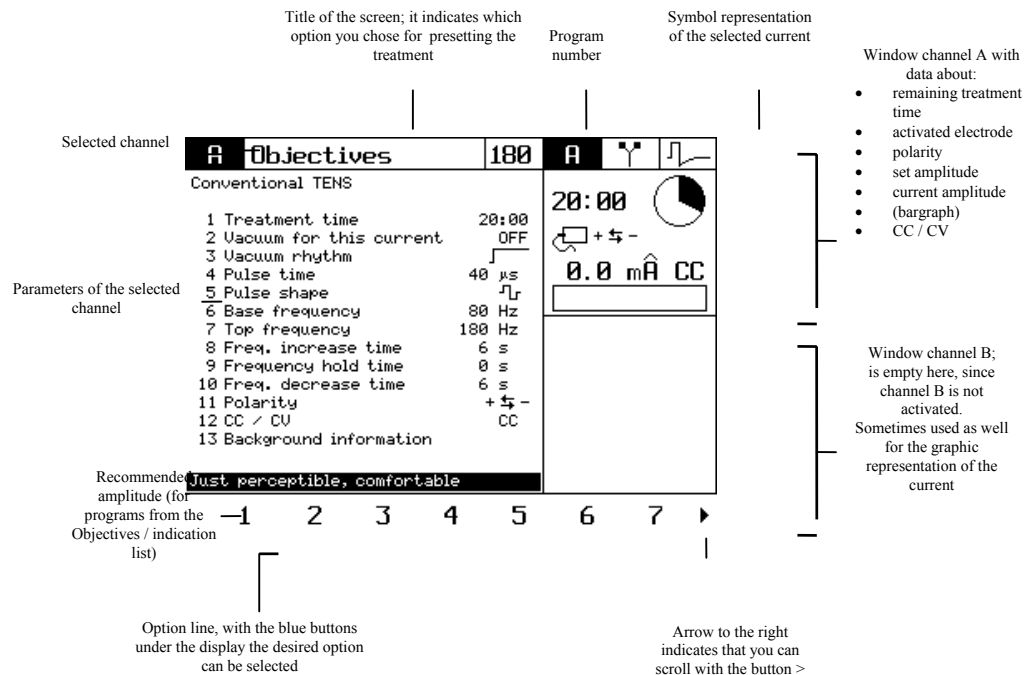
- an ambient temperature range of -20°C to +60°C;
- a relative humidity range of 10% to 100%, including condensation;
- an atmospheric pressure range of 500hPa to 1060 hPa.

3. DESCRIPTION OF CONTROLS AND CONNECTORS.

3.1.1 Output connectors and control keys (drawing unit on last page of service manual).

1. Tilting display
2. Blue keys for menu option or parameter selection
3. Blue keys > and < for scrolling through the lists
4. Key  for increasing or setting a parameter
5. Key  for decreasing or setting a parameter
6. Key for channel choice A
7. Key for channel choice B
8. Amplitude controller for channel A
9. Amplitude controller for channel B
10. Therapy menu key 
11. Guidance menu key 
12. Memory key 
13. System settings key 
14. Help key ?
15. 'Go back' key 
16. Pause key 
17. Stop key 
18. Output channel A for plate electrodes
19. Output channel B for plate electrodes
20. Connections for the vacuum electrodes for channel A
21. Connections for the vacuum electrodes for channel B
22. Yellow pilot lamps, light when the channel concerned can produce current output
23. Vacuum controller
24. Stand-by lamp indicating that the appliance is connected to the mains and that the appliance is turned on
25. Main switch
26. Fuse holder
27. Mains entry
28. Label with appliance data
29. Connector to connect to the potential compensating mains
30. Drain tube of the water reservoir
31. Vent hole
32. RS 232 connector for service purposes
33. Mains switch
34. Patient cable
35. Plate electrodes
36. Vacuum tubes

3.2 Display indication overview



3.3 Technical specifications.

- Number of memory places 500 - 999
- Languages:
 - West European: English, German, French, Dutch
 - South European: Italian, Spanish, Portuguese, English
- Treatment time: 0 - 60 minutes
- Dimensions : 424 x 308 x 163 cm
- Weight: 9 kg
- Insulation class: I type BF
- Voltage: 110, 127, 220, 230 of 240 Volt AC, frequency 50 - 60 Hz, settings via an external switch
- Power consumption: maximum 96 VA
- Help screen for explanation on the selected electrotherapeutic current or parameter
- 2 independent channels with possibility to set different therapy forms per channel
- Extensive indication list with recommended therapy programs
- Sequential therapy forms
- Possibility to set various system settings and program parameters to the personal preference
- Built-in cable and electrode test
- Solid metal casing (Faraday's cage)
- Cover: ABS

Ultrasound output: probe model 891

ERA: 0,6 cm² at 1 MHz

ERA: 1,0 cm² at 3 MHz

Frequency: 1 and 3 MHz

BNR < 5

Pulsfrequency: 100 Hz

Duty Cycle: 10%, 20%, 30%, 40%, 50%, 100%

Ultrasound output: probe model 892

ERA: 4,0 cm² at 1 MHz

ERA: 4,8 cm² at 3 MHz

Frequency: 1 and 3 MHz

BNR: <8

Pulsfrequency: 100 Hz

Duty Cycle: 10%, 20%, 30%, 40%, 50%, 100%

3.4 Different symbols.

3.4.1 Symbols on the front of the Guidance E/C

Therapy menu	
Guidance menu	
Memory	
System settings	
Help	
Go back	
Stop	
Pause	
Amplitude	

3.4.2 Symbols on the right side of the Guidance E/C

Fuse



3.4.3 Symbols on the left side of the Guidance E/C

Input / output port (for service purposes)



Attention, sensitive for electrostatic discharges



3.4.4 Symbols on the back of the Guidance E/C

Water outlet



Do not open device



Equipotentiality



3.4.5 General symbols

Electrotherapy



Sequential currents



Iontophoresis



Channel A



Channel B



Alternating channels



Channel A+B



Treatment time



Plate electrode



Vacuum electrode



3.4.6 Symbols current groups

TENS currents



Unidirectional currents



NMES currents



Diadynamic currents



S-D curves, Rheobase /



Chronaxie / AQ



3.4.7 Symbols currents

Direct current	
Iontophoresis	
Medium frequency rectangular current	
Rectangular pulsed current	
Triangular pulsed current	
Conventional TENS	
Low frequency TENS	
Brief intense TENS	
Random TENS	
Burst TENS	
Rectangular surge current	
Triangular surge current	
Biphasic surge current	
Biphasic intrapulse interval surge current	
2-pole interferential surge current	
Russian stimulation	
Classical interferential surge current	
MF (Diadynamic)	MF
RS (Diadynamic)	RS
DF (Diadynamic)	DF
CP (Diadynamic)	CP
LP (Diadynamic)	LP
2-pole interferential current	
Isoplanar vector field	
Dipole vector field	
Classical interferential current	
Rheobase and Chronaxie	 CH
Rheobase and A.Q.	 AQ
S-D curve rectangular pulse	 S-D
S-D curve triangular pulse	 S-D
S-D curve rectangular and triangular pulse	 S-D

3.4.8 Parameter symbols

Polarity for plate electrodes	red-, red+
Alternating polarity for plate electrodes	+  -
Polarity for vacuum electrodes	 
Alternating polarity for vacuum electrodes	  
Vacuum rhythm: continuous	
1,5 s high, 1,5 s low	
1,5 s high, 3 s low	
1,5 s high, 4,5 s low	

4. UNIT SELF TEST.

The self test checks proper functioning of the product, especially the safety circuits, and is activated every time the unit is switched on. The tests are performed by the main micro-controller in combination with the safety micro-controller and take approximately 3 seconds.

When one or both of the controllers detect an error, the output will be disabled. A message will be shown to the user.

The Guidance E/C has a safety relay (RLY13). This relay (Normally Open) is integrated in the applied part of channel A and Channel B (same relay). In case of a problem, the safety relay will be switched off immediately and the patient becomes disconnected from the unit.

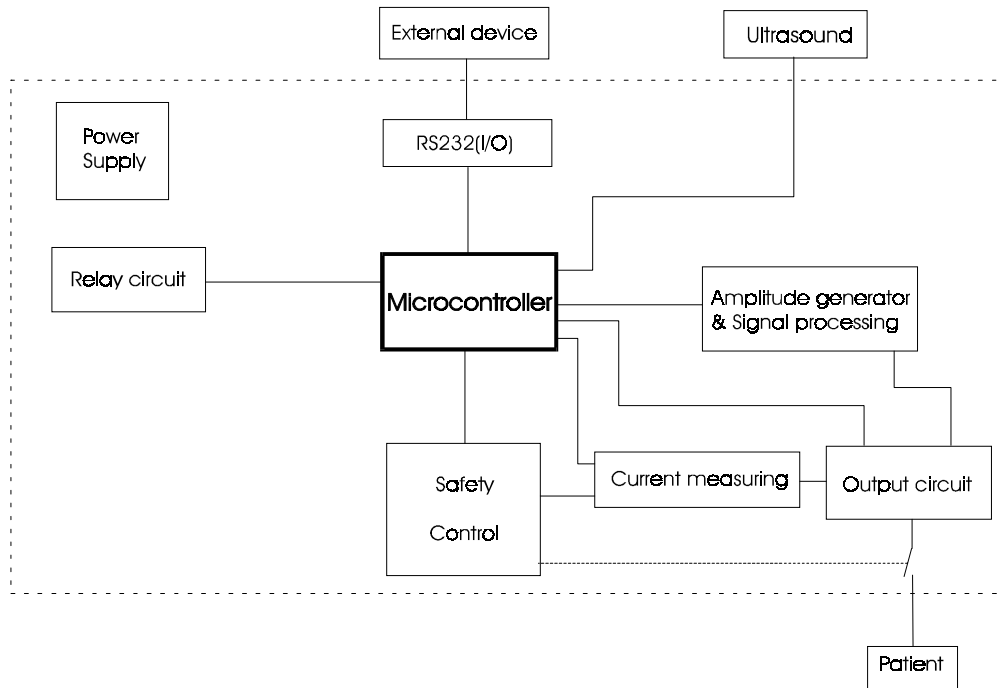
The safety relay driver circuitry is accessible to the main microprocessor for 3 seconds after power up of the unit. After this period the main micro-controller will not be able to switch the electrotherapy safety relay on any more. Both the main and the safety micro-controller are able to switch the electrotherapy safety relay off (the safe state).

During the selftest of the unit, the following items are checked:

1. Main controller test.
2. Safety controller test.
3. Safety software test.
4. Electrotherapy DAC test Channel A
5. Electrotherapy DAC test Channel B
6. Electrotherapy relay test.
7. Electrotherapy safety comparator test.
8. AC/DC relay test.
9. CC/CV mode test.

.

5. CIRCUIT DESCRIPTION



5.1 Main PCB (ELUS004-L100).

The main PCB contains most of the electronic circuits of the Phyaction Guidance E/C. Since the layout of the PCB is mainly SMD based, most repair works can only be done by GymnaUniphy nv.

Limited repair works may be done only after the permission of GymnaUniphy nv.

For this reason, it is strongly recommended to keep at least one main PCB in stock, in order to solve most problems in the most efficient way.

♣ The main PCB of the Phyaction Guidance E/C is exactly the same as the main PCB of the Gymna Combi 500/Duo500. Some installed components are not used in the Guidance/C but only in the Combi 500.

5.1.1 Power supply.

The mains voltage is applied to a ringcore transformer so that one single voltage of 24 VAC appears at TP59.

However, due to tolerances on the line voltage, the output voltage of the transformer may vary between +21 VAC and + 40VAC.

The secondary of the transformer has a fuse of T 5A L (F1) that is installed on the main PCB.

A SMPS supply, built around U2 and TR1, is used to provide the supplies for the amplifier circuits (+/- 18 V).

These +/- 18 V signals are regulated to several other DC voltages by linear voltage regulators:

+ 18VDC	TP1
+ 15VDC	TP11
+ 12VDC	TP2
- 5VDC	TP4
- 15VDC	TP72
- 18VDC	TP3
- 22 VDC	TP73 (non stabilized for LCD contrast)

The +18 V and -18 V are used as supply for the amplifier circuits. Therefore they are constantly monitored by U45. In case of a strong deviation, the voltage lockout (UVLO) signal becomes 'LOW', the safety relay will be switched off and an error will be generated.

The UVLO signal is connected to the safety processor.

Since the +18V is used in the feedback loop for the SMPS, the -18V may fluctuate. In order to keep this voltage within the limits, there is a clamp system (built around Q14) installed onto this supply.

VCC (+5 VDC) is also generated by a SMPS built around U30.

The VCC is also constantly monitored (U46). If this voltage goes below 4.75 V, there will be a reset signal (POR) and the safety system will be activated.

The POR signal is directly connected to the microcontroller.

5.1.2 Micro-controller Circuits.

The 16 bit micro controller (U3: Siemens C167) is the heart of the system that controls and drives all the other circuits and signals, together with the safety controller (U36: PIC 16C74)

The program software is stored in a flash memory (U54, U55: AM 29F800). An upgrade of this software can only be done by means of a PC, which must be connected to the unit in order to download the software (chapter x).

The actual version of the software is displayed in the start-up screen.

The micro-controller uses external RAM (U42 and U41: 256K each).

A separate display controller (U49: SED 1353) + RAM (U39 and U40: 256 K each) perform the controls of the LCD display.

U50 is a programmable peripheral interface IC which drives mainly the relay circuit.

Other components near the microcontroller circuits are:

Temperature sensor RT1: measuring the temperature of the heatsink, which controls the working of the fan in the following way:

- Temperature > 55°C: switch on fan
- Temperature < 45°C: switch off fan
- Temperature > 98°C: error and switch off all amplifier circuits.

U52: reading OTP values (not used in Phyaction Guidance E/C).

Microcontroller guard component (U 64):

Amplitude generation circuits: U14 produces a **DC** signal in relation to the demanded intensity. The output signal of U14 is the reference value for U24 that produces the amplitude modulated (AM) signals for the LF currents (MF, DF, CP, LP, IF).

The output signals are connected to the signal processing circuits.

5.1.3 Safety control circuits.

The main goal of the safety circuit is to protect the patient and the Electrotherapy circuit from too high currents.

In case of an error, the safety relay is switched off and a error code is generated.

A special safety controller (U36: PIC16C74) monitors and controls all the safety components used in the Guidance E/C.

♣ Note that even when an error is not longer occurring, the output state of the RS flipflop stays 'low' and the safety relay remains off. The unit must be restarted in order to continue any treatment.

The following items are constantly checked:

Measured current in relation to the set intensity:

Comparator U1 and DAC U25 guard the output level. U1 compares the output signals from the current measuring circuit (CUR_A SAF/CUR_B SAF) with the reference voltages (FDBACK_SAFA/FDBACK_SAFB). These reference voltages are generated by the safety DAC U25 and are setup by the microprocessor U36.

In case of a problem, the PROTECTION signal will go 'LOW' and the safety relay is switched off. The limit values are different for each current waveform plus they depend on the set intensity level. The safety controller sets the limit for each current waveform via the AD converter U 25.

Proper functioning of both the microcontrollers:

If the PIC microcontroller detects a problem with the Siemens microcontroller, it will switch off the safety relay by making the MC_SRY_off signal 'high' (microcontroller safety relay off).

If, on the other hand, the Siemens microcontroller detects a problem with the PIC, it will switch off the safety relay by making the S_SRY_off signal 'high' (Siemens safety relay off).

VCC:

In case the VCC (5V) goes below 4.75 V, an error is generated via the POR line which causes the safety relay to switch off.

Rotary channel A and B:

The value of the encoders (= intensity knob) are measured by the PIC and compared by the Siemens microcontroller.

In case of a difference, the safety relay is switched off and an error is generated.

The safety controller also reads and processes the values of the keyboard.

5.1.4 Signal processing circuits.

♣ The signal processing and stimulation circuits are identical for channel A and channel B. Only the circuits for channel A are explained.

The signal processing circuits are built around U11 (CH A). This IC is a programmable sinusoidal generator, producing a sinusoidal signal of a determined frequency. The form of the amplitude is determined by DAC U24 and U14.

Depending on the type of current the therapist has chosen, the multiplexing IC U34 (CHA) will select the right input and connect it to the amplifier circuits (Pow A):

X0: sinusoidal signal sometimes modulated in amplitude (depending on current waveform).

X1: fixed voltage.

X2: DAC_A: amplitude modulated signal for diadynamic currents (without sinusoidal component).

X3: inverted signal of X0.

5.1.5 Stimulation circuits.

After the amplitude and/or the waveform of the signal are generated the stimulation circuit amplifies it, turns it into a CC or CV signal and if necessary changes the polarity and/or rectifies the signal.

Basically there are four possible hardware configurations, and the amplifier circuit can be redrawn according to each configuration.

Configuration 1: mode CC, pulsed (tens, rectangle, triangle, diadynamic).

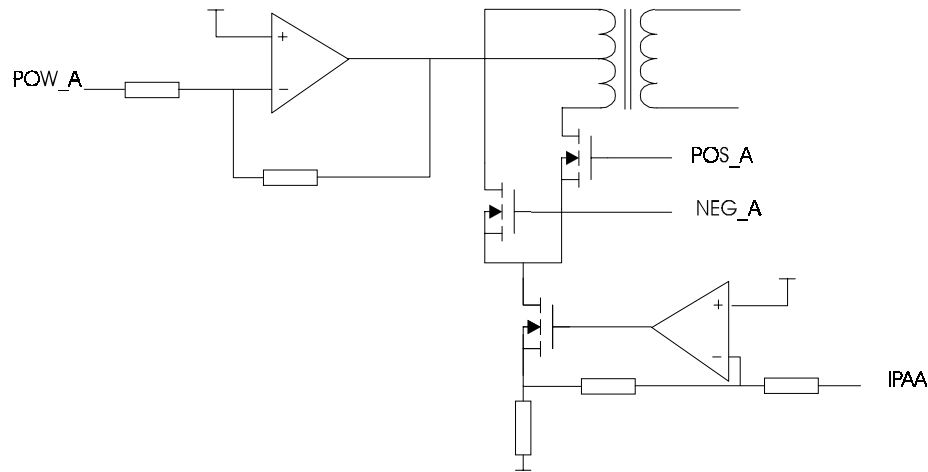
Configuration 2: mode CC, continuous (interference, direct continuous).

Configuration 3: mode CV, pulsed (tens, rectangle, triangle, diadynamic).

Configuration 4: mode CV, continuous (interference, direct continuous).

Configuration 1

The circuit can be redrawn as in the figure below.



The output of U9 (TDA 2040) is a DC signal and is connected to the middle connection of the transformer.

One side of the transformer is connected to Q1 and the other side is connected to Q2. The gates of Q1 and Q2 are connected to POS_A and NEG_A respectively. The sources of Q1 and Q2 are coupled via Q7 and R3 to ground.

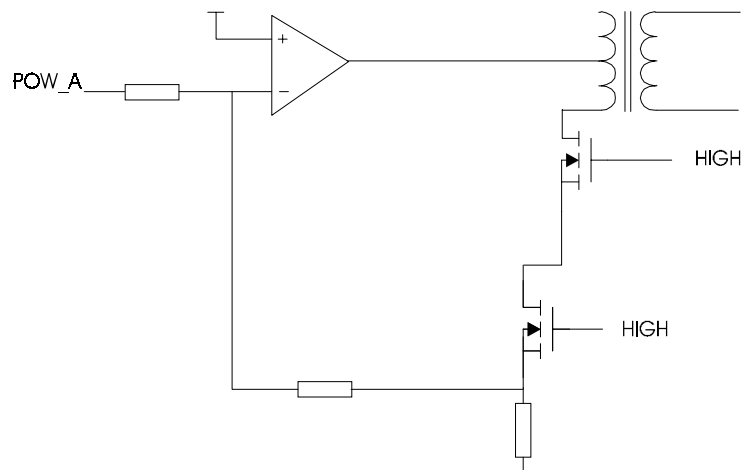
The current through Q7 is controlled by the output of U65. IPAA is a measure for the current through Q7 and so controls the output amplitude. The measured current (over R3) is fed back to the input of U65, this way the current is kept constant.

In case of a rectangular or triangular signal the signal at the secondary of the transformer will be rectified.

Configuration 2:

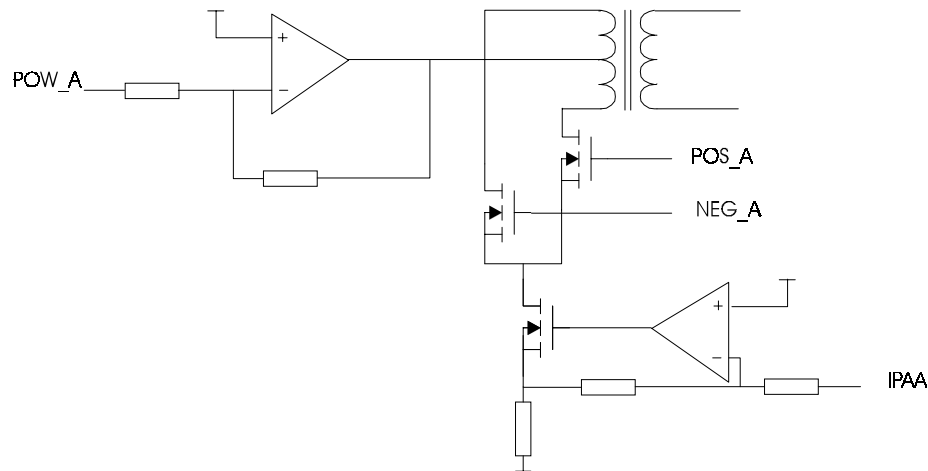
In comparison with configuration 1 , Q1 will be excluded from the circuit and POS_A and CURRENT_A will be continuous 'HIGH'.

The amplitude of POW_A is a measure for the output current and the current is fed back via R3 to the input of U9, in order to keep the current continuous.



Configuration 3:

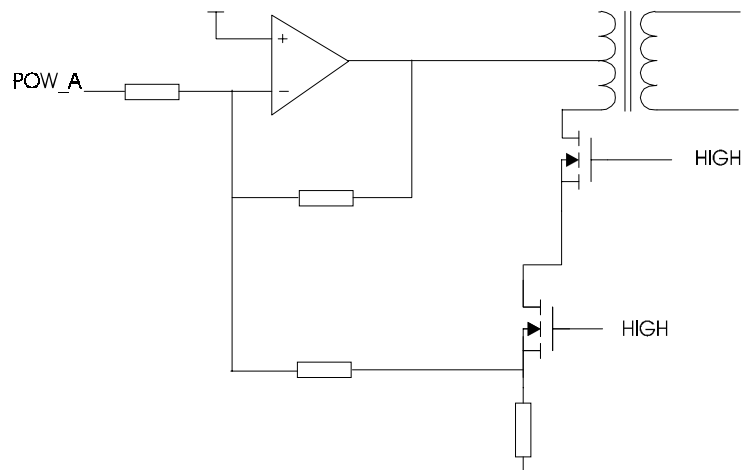
It is similar to configuration 1, but with the difference that the signal POW_A is not a fixed value, but is variable and a measure for the output amplitude and shape. Just as with CC, the maximum current is limited by IPAA.



Configuration 4:

Q1 is excluded and the gate of Q2 is kept 'HIGH' and there are two feedback circuits, namely the voltage at the output of U9 via R109 and the current through R3 which will give the output stage a virtual internal resistance.

Short circuiting the output, the output current will not exceed its maximum value.



5.1.6 Current measuring circuits.

At the output the current is measured by the current measurement circuit. The current measuring circuit translates it into a DC level that serves as an input for the Safety control circuit and for contact detection.

5.2 Output circuits.

The output module consists of 2 electrotherapy channels and 2 vacuum channels (with 4 vacuum connections).

Each configuration of electrotherapy and vacuum is possible.

The output PCB contains of the output circuitry for the use of electrotherapy with or without vacuum. Whether vacuum is used or not is determined by the micro controller via several relays.

Both channels can be switched off separately via micro controlled valves.

The vacuum can be set between 50 and 400mBar in the continuous mode. In the pulsating mode the vacuum can be set between 60 and 600mBar.

The level of the vacuum is controlled by means of the vacuum pump and an air inlet via a valve.

The water that comes into the system is collected into a water reservoir. The water reservoir can be emptied via an external tube.

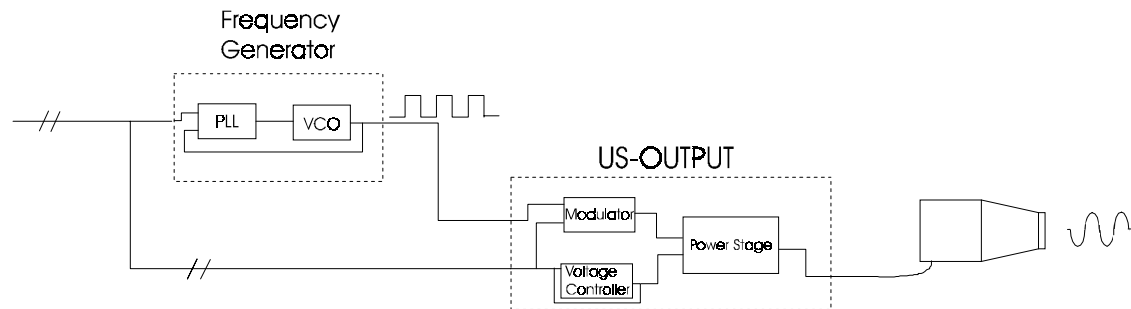
5.3 Console circuits.

The console module is the module that forms the interface to the user.

The interface consists of:

- A rubber keypad that makes the contact via a membrane keyboard on the console PCB. The matrix of the keys is controlled by the micro controller.
- Two encoders directly controlled by the micro controller
- The converter for the backlight controller

5.4 Ultrasound circuits (only for Guidance C)



5.4.1 PLL

The frequency generator is controlled by the micro controller and it contains a voltage controlled oscillator and a PLL (phase locked loop).

Each ultrasound crystal has different characteristics. Every crystal is measured during production, and an optimal working frequency and the 'bad contact' frequency is determined. This means that the ultrasound output stage works on different frequencies according to which head is connected.

In order to 'program' different frequencies, a PLL is used in combination with a VCO.

To obtain a symmetrical steering signal for the power stage the modulator switches its outputs with half the input frequency. Also the modulator mixes the duty signal synchronously with the ultrasound frequency to prevent spikes. An amplitude modulation with 100% modulation depth (the signal being switched on and off) is the result of this mixing.

The calibration values of each ultrasound head are stored in an OTP, which is installed inside the ultrasound head.

In case of a replacement of the crystal, the OTP has to be replaced as well (comes with the crystal)

5.4.2 Voltage controller.

A pulse controlled downward converter voltage controller is used to convert the +24V to the desired ultrasound voltage. The voltage controller is made in such a way that its output voltage is linear proportional to its input voltage V_{US_set} . Thus the micro controller can adjust the ultrasonic power by setting V_{US_set} proportional to the square root of the desired output power.

5.4.3 Power stage

The power stage is a switched balance class-D end stage. Power MOSFETs are used as switching elements. The MOSFETs are driven by buffers (U506) that also take care of a small delay in driving the MOSFETs, to prevent them of being active simultaneously. If either one of the MOSFETs has become defective, both of them should be replaced.

5.4.4 Impedance matching

The ultrasound crystal is mainly a capacitive load. Its impedance differs, among other things, with the size of the crystal and its operating frequency. For this reason the micro controller can match the impedance by switching one or two inductors and when necessary capacitors in the output stage.

5.5 RS 232 communication.

This interface is used for:

- externally programming the device (service)
- internally programming the device (production)
- future applications

The signals that are used for sending and receiving data from and to an external device, must be isolated according to IEC601. Also the supply must be isolated.

The supply is isolated via a transformer and the signals are isolated with opto-couplers.

At both sides of the opto-couplers a send/receive IC is necessary to comply to the standard levels.

The maximum speed of the connection is mainly determined by the speed of the opto-couplers which is 38400 bits/sec (baud rate).

Downloading new software will take approximately 10 minutes.

5.6 Vacuum unit.

5.6.1 General information.

The Guidance E/C has a 2 channel integrated vacuum module with the following specifications:

Continuous mode: 50 → 320 mBar +/- 10% on maximum level.

Pulsed mode : 65 → 480 mBar +/- 10% on maximum level.

Rhythm on/off time (sec): 1.5/6.0 ; 1.5/4.5 ; 1.5/3.0 ; 1.5/1.5

The vacuum module has the following components:

- Water reservoir.
- Pump.
- Rhythm valve.
- Valve channel A.
- Valve channel B.
- Vacuum PCB.

Since the electrotherapy channels work completely independent, it also goes for the vacuum channel. This means that the therapist is able to work eg. on channel A with electrodes and on Channel B with vacuum.

Switching on/off the vacuum can be done by means of a parameter selection on the therapy menu. The vacuum pressure for both the channels must be set by means of the vacuum knob on the front side of the unit.

5.6.2 Vacuum circuits.

The vacuum is measured by means of the vacuum sensor S101 (wheatstone bridge). The measured value is compared with the set value (VACSET) by U102A and a PWM generator (U102B) controls the pump when necessary.

The vacuum intensity can be set by means of a knob on the front of the unit (VACSET signal).

When the measured vacuum is higher than the set vacuum, the rhythm valve will be open until the vacuum reaches its normal level (Vvac)

Both the channels A and B have their own valve which means that each vacuum channel can be selected separately (VAC/NRM A and VAC/NRM B).

When a pulsed vacuum treatment is selected, the V-Rhythm signal will open and close the rhythm valve in accordance with the pulse selection.

All valves are Normally Closed and will be opened by means of a 24 VDC signal.

The water level in the reservoir is checked on constant base. A block signal, produced by U107, is presented to one of the metal detection pin inside the reservoir. If the water reaches a certain level, this signal will be transmitted to the second detection pin.

This signal is picked up by U106, and a signal is given to the microprocessor via the H2O level line.

If the microprocessor detects a full reservoir, the following message on the screen appears 'water reservoir full'. It is still possible to continue the treatment.

If the message appears before the treatment is started, it is impossible to switch on the vacuum unit.

6. Ultrasound heads (only Guidance C)

The Guidance C can be delivered with 2 different multifrequent ultrasound heads:

Model 891 : 1 cm² 1/3 MHz

Model 892 : 4 cm² 1/3 MHz

(See technical specifications for more details)

The unit has two different ultrasound output connector on which each head can be connected (in every configuration).

The ultrasound head converts the electric signal into ultrasound using a piezo crystal. This crystal, with a diameter depending on the desired head size, is glued in an aluminium cup that minimises electromagnetic radiation and enables the crystal to be used on to operating frequencies.

The aluminium cup can also be used as a second electrode if combination therapy is desired. A separate electrotherapy device needs to be connected to the safety socket for combination therapy.

An OTP is installed in the treatment head to enable the micro controller to detect whether a head is connected and to recognise the type of head that is connected. It also contains the calibration values of the head in question.

The ultrasound head has a visual contact control indication: the treatment heads are fitted with light of two colours, yellow and green.

The following configurations are possible:

Yellow light continuous indicates: the treatment head gives US energy

Yellow flashing indicates: end of treatment

Yellow/green flashing indicates : there is no contact during treatment.

Green flashing indicates : just connect the US head, device is reading the OTP data

Green continuous light indicates : the treatment head is selected

Repairing of Ultrasound heads: technical bulletin.

7. Yearly checkup and safety test

7.1 Safety inspection.

To prevent your Guidance from having hidden defects acquired during its lifecycle it is strongly recommended to have the device checked regularly for its proper functioning by qualified personnel. In some countries this is mandatory or your insurer may be requiring it. A record of these inspections should be filed so the measurements can be compared with earlier values to alert for a possible potentially dangerous tendency. To this purpose you can e.g. make copies of these pages.

♣ This document is also available in the Guidance E/C guideline.

7.2 Inspection interval.

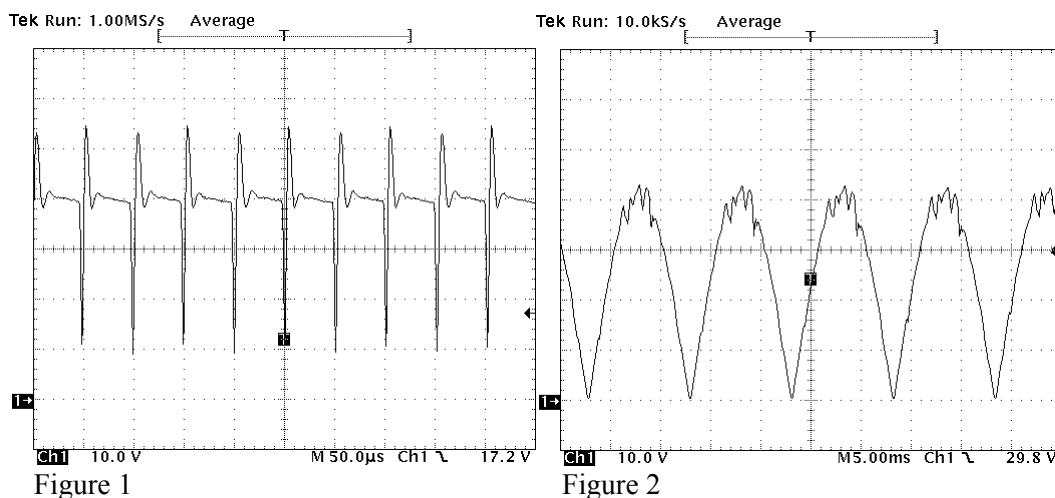
The design of the device is based on a yearly inspection. If the legislation of your country or your insurer call for a shorter period you should adhere to the latter.

7.3 Inspection results.

The inspection is passed when all items as presented on the standard document on the next page are passed. In the unlikely event the device fails the deviation should be fixed before recommissioning it. Repairs are only to be made by technicians authorised by GymnaUniphy nv. Contact your supplier on this matter.

7.4 Different current wave forms for checkup.

The following figures are the references for the different current wave forms as explained in the checkup document.



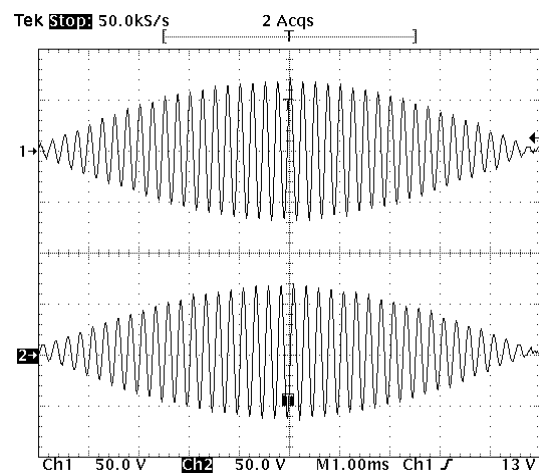


Fig 3

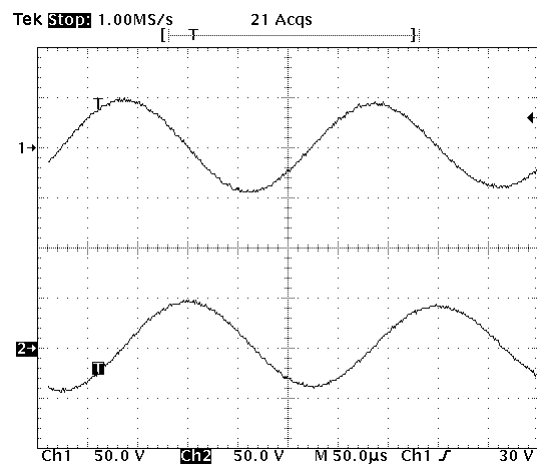


Fig 4

Checkup and safety document

7.4.1.1 Visual inspection

- The device record is present and kept up to date
- The user manual and the safety manual are present
- Device label and suppliers label are clearly readable
- The enclosure of the appliance is undamaged
- Mains entry, equipotential post and the sub-D connector are undamaged
- Patient cable connectors and vacuum posts are undamaged
- The control knobs, keys and display are undamaged
- Only accessories listed in the user manual are being used
- Mains wire, electrodes and cables are undamaged

Pass	Fail

7.4.2 General Functional Inspection

- The automatic self test on power up does not report any errors
- The display does not show any defective pixels or lines
- All keys are functioning
- The control knobs operate properly: 1 mA/click up when turning clockwise and down when turning counter clockwise respectively

Pass	Fail

7.4.3 Functional Inspection Electrotherapy

Connect two 500 Ω loads to both normal electrode pairs. Attach to them an oscilloscope (black to ground) with its controls set to the values as shown in the pictures below.

Press  and select “Program number” (3rd softkey). Set the program number to 138 with the -key and “go to selected program” with the 1st softkey (direct current). Turn up the intensity of both channels to maximum with the control knobs.

- The output signals as seen on the oscilloscope correspond with figure 1
- The output currents matches the values shown on the display within $\pm 10\%$
- The two yellow lights next to the output connectors are on
- The polarity changes over to negative when set to “RED-“ for both channels
- The warning message “bad connection to patient” appears when the load is disconnected
- After this warning appeared the intensity is decreased to zero

Pass	Fail

--	--

Pass	Fail
1. The system is able to handle the load. 2. The system is able to handle the load. 3. The system is able to handle the load. 4. The system is able to handle the load. 5. The system is able to handle the load. 6. The system is able to handle the load. 7. The system is able to handle the load. 8. The system is able to handle the load. 9. The system is able to handle the load. 10. The system is able to handle the load.	1. The system is unable to handle the load. 2. The system is unable to handle the load. 3. The system is unable to handle the load. 4. The system is unable to handle the load. 5. The system is unable to handle the load. 6. The system is unable to handle the load. 7. The system is unable to handle the load. 8. The system is unable to handle the load. 9. The system is unable to handle the load. 10. The system is unable to handle the load.

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Pass	Fail
1. The student can identify the main idea of a passage. 2. The student can identify the supporting details of a passage. 3. The student can identify the author's purpose in writing a passage. 4. The student can identify the author's tone in a passage. 5. The student can identify the author's point of view in a passage. 6. The student can identify the author's bias in a passage. 7. The student can identify the author's audience in a passage. 8. The student can identify the author's style in a passage. 9. The student can identify the author's structure in a passage. 10. The student can identify the author's language in a passage.	1. The student cannot identify the main idea of a passage. 2. The student cannot identify the supporting details of a passage. 3. The student cannot identify the author's purpose in writing a passage. 4. The student cannot identify the author's tone in a passage. 5. The student cannot identify the author's point of view in a passage. 6. The student cannot identify the author's bias in a passage. 7. The student cannot identify the author's audience in a passage. 8. The student cannot identify the author's style in a passage. 9. The student cannot identify the author's structure in a passage. 10. The student cannot identify the author's language in a passage.

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Parameter	Meas. Value	Limit	Comments	Pass	Fail
Protective earth resistance	Ω	$< 0.2 \Omega$			
Enclosure leakage current	μA	$< 1000 \mu A$			
Patient leakage current	μA	$< 5000 \mu A$			

.....

8. SYSTEM SETTINGS MENU.

The system settings menu allows the user to personalize a number of parameters and to perform a cable and electrode test.

It is also the menu between the main menu and the service menu.

In order to select the system settings menu, press the  key.

The following screen appears:

A	SYSTEM SETTINGS	
1 Contrast	10	
2 Language	Engl.	
3 Sound settings		
4 Change pre-settings		
5 Stand-by time	10:00	
6 Plate electrode test		
7 Cable test		
8 System information		
9 Text for start up screen		
10 First screen	GUIDANCE	
11 Copy channel parameters	OFF	

1	2	3	4	5	6	7	▶
---	---	---	---	---	---	---	---

8.1 Contrast settings.

It is possible to set the contrast between 1-10.

Factory setting: 10.

8.2 Language.

There are four different languages available in the West European version:

- English.
- Nederlands.
- Français.
- Deutch.

There are also four different languages available in the South European version:

- English
- Italian
- Spanish
- Portuguese

8.3 Sound settings.

Pressing key 3 enters the sound settings menu, where different sound settings can be done.

A SYSTEM SETTINGS		
Sound settings		
1 Beep at end of treatment	ON	
2 Beep at pressing of a key	ON	
3 ET stimulation beep	OFF	
4 Beep volume	5	
5 ET contact beep	OFF	
1	2	3
4	5	

8.4 Change pre settings.

Pressing key 4 in the system settings menu, enters the pre-settings menu.

A SYSTEM SETTINGS		
Change pre-settings		
1 Save new settings		
2 Restore Uniphy pre-settings		
3 Restore ALL Uniphy pre-sets		
1	2	3

GymnaUniphy nv. advises standard treatments in the THERAPY menu (). However, these parameters can be changed and stored in memory.

Select a treatment in the Therapy menu and change one or more parameters.

Now press the System settings key an go to the pre-settings menu. The new parameter of this program can now be stored by pressing key 1 (save new settings).

In order to restore the Uniphy pre-settings of one particular therapy, first select the therapy and then press the system settings key .

Press key 2 in order to restore the original Uniphy settings for this particular program.

In order to restore all the Uniphy presets (for every fixed therapy), press key 3.

8.5 Stand by time.

The standby time can be changed to 20 min, 15 min, 10 min, 5 min or can be switched off.

8.6 Plate electrode test.

It is normal that rubber electrodes degrade in function of time. The resistance will raise irregularly over the surface of the electrode. As a result the current path will be the highest on the points with the lowest resistance and there will be a risk of burning the patient's skin.

In order to assure that the customer always works with accessories that are in perfect condition, the unit constantly monitors the resistance of the output circuit.

When this resistance passes a certain level, the unit will give a warning 'poor connection to the patient' and the intensity will be reduced to 0 mA.

However the unit always measures the resistance of the output circuit, GymnaUniphy nv. recommends to replace the rubber electrodes twice a year.

The vacuum electrodes have a metal electrode and will not degrade in function of time. Therefore the Phyaction Guidance E/C has no vacuum electrode test.

However it is recommended to check and clean the surface of the vacuum electrodes twice a year. In case of any irregularity replace the electrode.

Before checking the electrodes, it is important that the patient cable has been checked and has proved to have a perfect condition (see point 5.1.1)

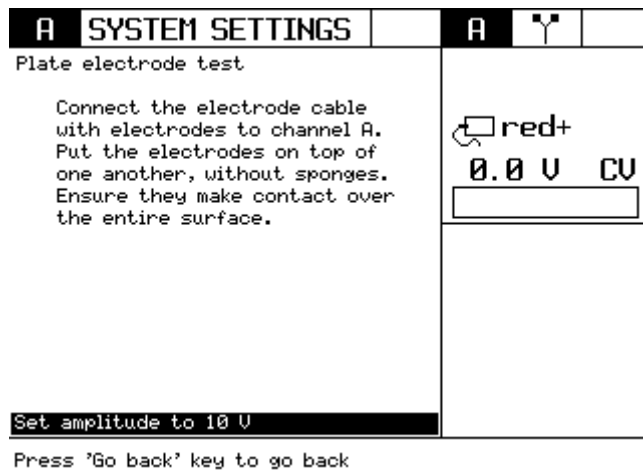
Please follow the procedure below to check both the rubber and the vacuum electrodes.

Select 'plate electrode test' in the system settings menu.

Connect a patient cable to the channel A and put the electrode on top of each other.



Turn up the intensity to 10 V and move with the plugs and cable to detect a bad contact. The unit will now display whether the electrodes are 'ok' or 'bad'.



It is recommended to replace electrodes twice a year.

8.7 Cable test.

Important: a cable test can only be performed through channel A, for both the plate electrodes cables and the vacuum cables.

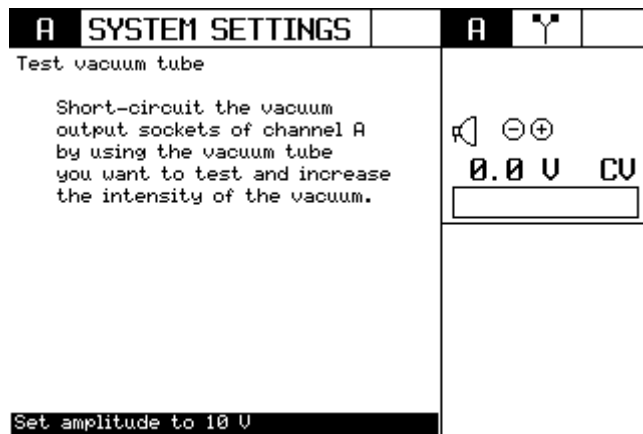
8.7.1 Vacuum cable test.

Select 'cable test' in the system settings menu.

Connect the first vacuum cable to the channel A output (by making a shortcircuit).



Turn up the intensity to 10 V and move the plugs and cable to detect a bad contact. The unit will now display whether the cable is 'ok' or 'bad'.



Press 'Go back' key to go back

Replace the cable if the test gives a negative result.

Perform the same test for the other cables.

⚠ Due to lime residues a bad contact between the vacuum cable and the output plug may appear, resulting in a negative test of the vacuum cable. In order to prevent this, GymnaUniphy nv. recommends to remove all the vacuum cables once a week, in order to scratch off the lime residues.

8.7.2 Electrode cable test.

Select 'cable test' in the system settings menu .

Connect the patient cable to the channel A (without the plate electrodes) and make a short-circuit with the supplied connector.



Turn up the intensity to 10 V and move with the plugs and cable to detect a bad contact. The unit will now display whether the cable is 'ok' or 'bad'.

A	SYSTEM SETTINGS	A	
Cable test Connect the electrode cable to channel A and short-circuit the male connectors of the cable with the test plug.		 red+ 0.0 U CV 	
Set amplitude to 10 U			

Press 'Go back' key to go back

Perform the same test for the other patient cables.

8.8 System information.

A	SYSTEM SETTINGS	
System information Serial number PCB: 1234130 Software version: 0.99 Software version MC 1.08 Last calibration date: 09032000 HW version main PCB: 1AAA		

Press 'Go back' key to go back

This is an important screen for the service department.
 In case of a problem, ask the customer to read the parameters of this page. It might help to detect the cause of a problem.

8.9 First screen.

When the unit is switched on, the unit will give a start-up screen. It is possible via the 'first screen' menu, to program the name of the Physiotherapist into this start-up screen.

A	SYSTEM SETTINGS	
Text for start up screen		
Textbox: PHYSIOTHERAPY		
»	JANSE	«
Textbox:		
1 Move cursor to the left 2 Move cursor to the right 3 Move to next line 4 Erase line 5 Ready and save		

1 2 3 4 5

8.10 Copy parameters.

When this parameter is switched ON, the selected current on channel A can easily be copied to channel B. Just press the B-key and the same parameters will be copied to the B channel.

9. SERVICE MENUS.

The Guidance-E/C has a built in service menu which allows to check different important service issues.

To enter the service menu, first go to the ' system settings' menu () and then press the 'Pause' key () for about 5 seconds. The following screen will appear.

A GUIDANCE		
SERVICE		
1 Counter working hours		
2 Error history		
3 Reset working-hours		
4 Reset all user settings		
5 Total reset settings		
1	2	3
4	5	

9.1 Counter working hours.

Enter this menu by pressing '1'.

This menu will give you the following information.

A GUIDANCE		
Counter working hours		
ET plate electrodes A		1' 17
ET vacuum electrodes A		0 s
ET plate electrodes B		971 s
ET vacuum electrodes B		0 s

Press 'Go back' key to go back

If you have detected a problem with the electrodes or with the patient cable, this menu will show you how many hours the different accessories have been used.

It is obvious that this information will only be reliable if the customer didn't replace the electrodes or cables by himself.

To reset this values, see point 8.3.

9.2 Error history.

Enter this menu by pressing '2'.

This menu will give detailed information of the last 10 errors that have been occurred.
This is an important tool to detect a problem, especially when it concerns intermittent errors.

A GUIDANCE				
Error history				
Total nr. of errors:				21
Nr	Error	Val1	Val2	Val3
21:	35	5	132	101
20:	35	5	132	101
19:	602	20	2	20
18:	35	5	129	20
17:	602	13	24	20
16:	602	13	23	20
15:	35	5	129	23985
14:	35	5	129	228
13:	35	5	129	218
12:	35	5	129	460

Press 'Go back' key to go back

It is possible to see the last 10 errors.

Nr: the error number (maximum value:

Val 1: The second column gives the error number.

9.3 Reset working hours.

In case electrodes or cables are replaced, it is recommended to put the particular working-hours indication to zero.

Select the accessory that needs to be reset and confirm with the same key to reset to zero.

A GUIDANCE				
Reset working-hours				
1 Reset work.h. plate electr. A				
2 Reset work.h. vacuum electr. A				
3 Reset work.h. plate electr. B				
4 Reset work.h. vacuum electr. B				
Press again to confirm				
1	2	3	4	

9.4 Reset all user settings.

It is possible to reset all the settings the user had made to the factory settings.
The following items will be set to factory settings:

All settings of the system settings menu:

A	SYSTEM SETTINGS		
1	Contrast	10	
2	Language	Engl.	
3	Sound settings		
4	Change pre-settings		
5	Stand-by time	10:00	
6	Plate electrode test		
7	Cable test		
8	System information		
9	Text for start up screen		
10	First screen	GUIDANCE	
11	Copy channel parameters	OFF	

1

2

3

4

5

6

7

▶

All self made programs.

9.5 Total reset settings.

This menu resets the user settings as well as the counting working hours and the error history.

⚡ All these settings are stored in the serial eeproms on the main PCB. If a main PCB needs to be replaced, always perform a total reset.

9.6 Special service menu.

In the service menu, press the sixth blue key. A special service menu appears.

A GUIDANCE		
SERVICE		
1 HW Code PCB	1ABA	
2 Move cursor to the right		
3 Move cursor to the left		
4 Ready and save		
ET Plate A	2'55	
ET Vac A	589 s	
ET Plate B	4'41	
ET Vac B	37 s	
1	2	3
4	5	6
7		▶

This menu allows to change the hardware code of every the PCB.
See chapter 8 for more information about the hardware codes.

It also gives an overview of the total working hours of each module. The total working hours cannot be reset !

10. UPGRADING SYSTEM SOFTWARE

10.1 General information.

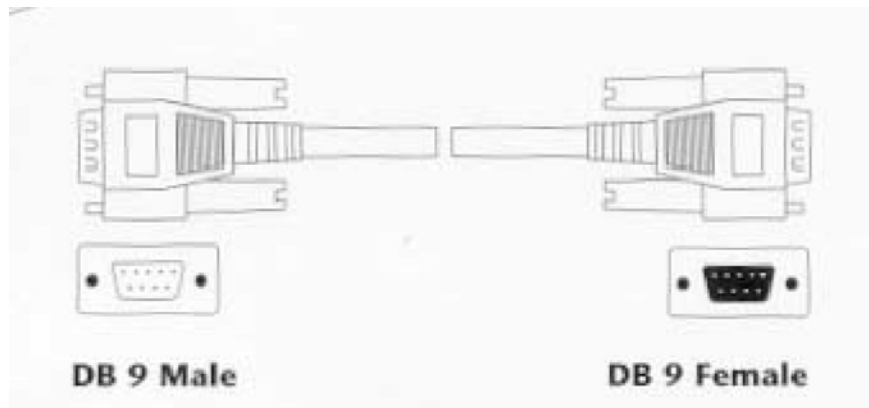
The software of the Phyaction Guidance can be updated without opening the enclosure of the device. There is a flash memory on the main PCB that can be reprogrammed using the serial RS232 interface on the left side of the unit.

The advantage of this system is that downloading software is cheaper than replacing a microcontroller, plus there is no risk of ESD because the device stays closed.

⚡ The Medical Device Directive does not allow end users to reprogram medical devices. This is only reserved to authorized service personnel.

10.2 Which tools are required ?

- In order to download the software, a PC with a Pentium processor and DOS version 5.X or higher is required.
- The file with the software to be programmed (provided on 3.5 inch diskette)
- A RS 232 cable with a 9 pins male sub-D connector at the Guidance end and a 9 or 25 pins female sub-D connector at the PC end.
- An unzip program like PKUNZIP or WINZIP.



10.3 Downloading the software.

- Start the PC and unzip the software on the disk.
- Connect the RS 232 cable between the PC and the Guidance E/C
- Switch on the unit and wait until the main menu appears.
- Run the program Flash1.bat when the device is connected to COM 1 or Flash2.bat when the device is connected to COM 2.
- The PC will connect to the Guidance and the download procedure will start.
The following screen will appear on the PC:

```
+-----+
| FLASH Programming Monitor V2.1                (C) 1999 |
| COM1          File:  <NONE>                   |
| Status: FLASH app.                            |
+-----+

P: Program FLASH      T: Terminal

X: eXit               ?: Display menu
```

The Guidance will show a special screen, indicating the KB that already have be downloaded.
When the download procedure is finished (after about 10 minutes) the following message appears:
'HEX programming done'.

- Now switch off the unit, wait a few seconds and restart the unit. The unit will now indicate the new software version in the startup screen.
- When the device is passing the selftest with success the device can be used normally.

10.4 Troubleshooting.

If the PC cannot connect to the unit, check whether the interface cable is properly connected and check whether the right COM port has been choosen.

Try the other batch file (Flash1.bat or Flash2.bat) to see if this solves the problem.

In case of any error (most of the time this will be error 601), switch off the Guidance and repeat the download procedure.

11. HARDWARE LABELS.

Each PCB has a label with the hardware code. GymnaUniphy nv. puts the label on the PCB during production.

The main PCB consists of an eeprom in which the actual hardware code of the used PCB is saved.

The hardware code consists of 4 characters and is composed as follows (from left to right):

0...	From 1 to 9.	Increase in case of a principle technology change.	Hardware is not compatible anymore. All previous changes made in hardware shall be inherited in the new layout. The last 3 alphanumerical numbers will begin with A
.A..	A to Z	Increase in case of a principle technology change.	Components are not anymore compatible with the previous layout. All previous changes made in hardware shall be inherited in the new layout. The last 2 alphanumerical numbers will begin with A
..A.	A to Z	Increase in case of component change.	
...A	A to Z	Increase in case of a PCB track change.	

Example:

Suppose that resistor R68 changes from 22 K to 100 K.

The actual hardware version 1AAA will be upgraded to 1ABA.

11.1 Upgrading the hardware code.

Every hard-or software change will be presented in a technical bulletin. In case of a hardware change GymnaUniphy nv. will provide the necessary components as well as a new hardware label. This label must be put on the upgraded PCB.

The hardware code also has to be modified in the serial eeprom. See chapter 6.6 for more details.

♣ The user can easily see the hardware code of each PCB in the system settings menu (see chapter 5.8).

12. TROUBLE SHOOTING

12.1 General information.

In case of a problem the unit will produce an error code. Intermittent error codes can be recovered by means of the service software, which gives an overview of the last 10 error codes.

If the error code is generated during the self test, and the cause of the problem is difficult to detect, there is a possibility to deactivate the control of the safety relay and skip the self test.

In order to deactivate the control of the safety relay, both the jumpers of CON 3 on the main PCB must be put from position 'OPERATE' to position 'SERVICE'. Putting the jumpers into 'SERVICE' position will avoid that the safety relay can be switched off.

Since the functioning of the safety relay is tested during the selftest, it will generate an error code when the unit is in 'SERVICE' mode.

Therefore the selftest must be bypassed. This can be done by putting a jumper on CON 9 (factory mode).

After both the 'SERVICE' jumper and the factory jumper are changed, the unit can be powered up without performing a selftest and without the possibility to deactivate the safety relay.

⚡ It is very important that after repairing the unit, the unit will be reset to 'OPERATE' and the factory jumper is removed before the unit will be used to treat a patient. Not following this instruction can bring the safety of the patient and the therapist is jeopardy.

In case the service engineer cannot solve the problem, it is recommended to communicate the problem with the GymnaUniphy nv. service department.

In order to communicate the problem the most efficient way, a special error registration document must be used.

Fill out the service form as complete as possible. Our service department will evaluate the call and propose further steps in order to solve the problem.

12.2 Interpreting error codes.

In case of an error, the following screen appears:

	ERROR
Error number:	602
Error value 1:	13
Error value 2:	24
Error value 3:	

Switch off the device and switch it on again.
If the ERROR appears again, contact the service department of your supplier.

Software version:	1.04
Latest calibration:	09032000
Serial number PCB:	1234130
Hardware version PCB:	1AAA

The unit gives an overview of the actual error. The error code can be traced in the error list (chapter 11.3).

Different codes:

Error number: defines the software module in which the error is detected.

Error value 1: the first error value which defines the individual test in the module which actually generated the error

Error value 1: an additional value which may give more information about the detected error.

Error value 2: (not used).

12.3 List of error codes.

This chapter defines the individual error numbers. Each error number is related to a software module. For each error number the code used in the software is defined, the number is defined and a short description about the purpose of the software module is given.

12.3.1 Drivers (0XX)

The driver layer contains modules responsible for direct interaction with the hardware and some general utility routines.

Error name	Nr.	Description
ERR_ADC	1	Analog to digital converter subsystem of the C167
	2	Not used
ERR_ASCMAIN	3	Serial interface data interpreter
ERR_ASW	4	Analog switch control (U34/U35)
ERR_BUZ	5	Buzzer
ERR_CCR	6	Capture compare registers, subsystem of the C167
ERR_CCT	7	Capture compare timers, subsystem of the C167
ERR_CHOP	8	Electrotherapy chopper
ERR_CRC	9	Software utility, CRC checksum support
ERR_DAC12	10	12 bits DAC control (amplitude, surge & vector)
ERR_DRW1353	11	LCD controller 1353 support
ERR_DRWBM	12	LCD bitmap routines
ERR_DRWGR	13	LCD graphics routines
	14	Not used
ERR_DRWTXT	15	LCD Text display
ERR_DRWVIP	16	LCD support for the VIP program
ERR_DS1	17	Dallas 1-wire bit level protocol
ERR_DS250X	18	Dallas DS2502 OTP support
ERR_FET	19	Direct control for the chopper FET's
ERR_FRQ	20	Electrotherapy frequency control
ERR_GPT1	21	General purpose timers group 1, C167
ERR_GPT2	22	General purpose timers group 2, C167
ERR_I2C	23	Bit level serial I2C support 4 I ² C connection to E ² PROM down (during self test)
ERR_IMATH	24	Integer math routines
	25	Not used
ERR_LCM	26	Lost-contact measurement and determination
ERR_LSIO	27	Laser I/O
ERR_LFD	28	Low frequency DAC (rect., tria., diadynamic)
ERR_LSF	29	Laser frequency
ERR_PEC	30	Peripheral event control, C167
ERR_PPI	31	82C55 I/O chip support
ERR_PWM	32	Pulse-width modulation support, C167
ERR_REL	33	Relay driver

Error name	Nr.	Description
ERR_S4W	34	Bit-level S4wire serial support
ERR_SC	35	Safety controller interfacing
		1 2 Safety controller defective or not inserted (during self test)
		2 1 Safety controller defective or not inserted (during self test)
		12 9 Safety circuit activated during normal use
ERR_SER	36	RS232 serial I/O support
	37	Not used
ERR_STST	38	Selftest
ERR_TENS	39	TENS modulation generation
	40	Not used
ERR_TSA	41	TSA6057 Ultrasound frequency PLL support
ERR_USD	42	Ultrasound dutycycle generation
ERR_USF	43	Ultrasound frequency generation
ERR_USIO	44	Ultrasound I/O (through PCF8057)
ERR_USP	45	Ultrasound power control
ERR_UTIL	46	General support routines
ERR_VIO	47	Vacuum I/O support
ERR_E2P	48	Low-level E2PROM support
ERR_FAN	49	Fan and temperature control

12.3.2 Operating system (1xx)

The operating system is responsible for task switching and for communication between the tasks.

Error name	Nr.	Description
ERR_Q	100	Task communication queue is full

12.3.3 Electrotherapy task (2xx)

The electrotherapy tasks respond to commands from the user interface, uses the drivers to start and stop waveform generation and reports the status of the electrotherapy back to the user interface. Electrotherapy task A may be used to control electrotherapy output A or A+B (for 2 channel waveforms), task B is only used to control the output B.

Error name	Nr.	Description
ERR_E_CTRL A	200	Electrotherapy task A state control
ERR_E_CTRL B	201	Electrotherapy task B state control
ERR_E_PARA	202	Parameter handling electrotherapy output A
ERR_E_PARB	203	Parameter handling electrotherapy output B
ERR_E_TASK A	204	Main module for electrotherapy task A
ERR_E_TASK B	205	Main module for electrotherapy task B

12.3.4 Ultrasound task (3xx) NOT FOR GUIDANCE E

The ultrasound task is responsible for control of the ultrasound therapy, including the detection of placement and removal of ultrasound heads.

Error name	Nr.	Description
ERR_U_CTRL	300	Ultrasound task state machine
ERR_U_CONT	301	Contact detection ultrasound
ERR_U_HEAD	302	Detection of placement and removal of ULS heads
ERR_U_SCAN	303	Support for ultrasound head scanning (production)
ERR_U_TASK	304	Main module for ultrasound task

12.3.5 Laser task (4xx) NOT FOR GUIDANCE E/C

The ultrasound task is responsible for control of the laser therapy, including the detection of placement and removal of laser probes.

Error name	Nr.	Description
ERR_L_CTRL	400	Laser task state machine
ERR_L_PRB	401	Detection of placement and removal of LAS probes
ERR_L_TASK	402	Main module for laser task

12.3.6 User interface task (5xx)

The user interface is responsible for communication with the user.

Error name	Nr.	Description
ERR_CNTR	500	User interface task main state machine
ERR_DELT	501	Display support, electrode placement pictures
ERR_DFUN	502	Display support, 'fun': dynamic waveform views
ERR_DHLP	503	Display support, help and information screens
ERR_DIND	504	Display support, indication list
ERR_DISP	505	Display support, main control module
ERR_DOUT	506	Display support, output windows
ERR_DPAR	507	Display support, parameters
ERR_DSCR	508	Display support, different screen types
ERR_DTAB	509	Display support, 2/3 and output window 'tab'
ERR_DTTL	510	Display support, title and head lines
ERR_DUTL	511	Display support, utility
ERR_ELT	512	User interface communication with ELT task
ERR_EVC	513	Event check functions
ERR_EVH	514	Main event handler
ERR_EVHP	515	Event handler, parameters
ERR_EVHT	516	Event handler, therapy
ERR_EVIN	517	Event input
ERR_FK	518	Function key assignment
ERR_ILST	519	Indication list support
ERR_LAS	520	User interface with LAS ask
ERR_MEM	521	Memory (E2PROM) support
ERR_MENU	522	Menu control

Error name	Nr.	Description
ERR_PAR	523	Parameter support
ERR_PLST	524	Parameter list
ERR_TASK	525	Main user interface task module
ERR_ULS	526	User interface communication with LAS task
	527	Not used
ERR_WRNG	528	Messages and warnings to the user
ERR_SAFE	529	User interface counterpart of safety controller rotary A
ERR_SAFE1	530	User interface counterpart of safety controller rotary B

12.3.7 System task (6xx)

The system task is responsible for the correct start-up and timing of the other tasks.

Error name	Nr.	Description
ERR_SYS	600	Main system task
ERR_SCPU	601	Processor memory self test
	16	Microprocessor internal RAM check failed
	32	Microprocessor internal check failed
	48	1 Wrong checksum in Flash boot sector
		2 Wrong checksum in Flash program sector
	10	Wrong checksum in Flash memory: parameter section
	11	Wrong checksum in Flash memory: symbol sector
	12	Wrong checksum in Flash memory: help text sector 1
	13	Wrong checksum in Flash memory: help text sector 2
	14	Wrong checksum in Flash memory: help text sector 3
	15	Wrong checksum in Flash memory: help text sector 4
	16	Wrong checksum in Flash memory: text sector 1
	17	Wrong checksum in Flash memory: text sector 2
	18	Wrong checksum in Flash memory: text sector 3
	19	Wrong checksum in Flash memory: text sector 4
	64	External RAM check failed
ERR_SELT	602	Electrotherapy self test
	1	1 Wrong initial state of safety controller
		2 Wrong initial state of safety controller
		3 SELFTEST OK command not sent within 3 s
	2	Temperature sensor RT1 shorted or open
	3	Wrong reference voltage from D80 or D81
	4	Wrong software version of safety controller
	10	Electrotherapy relay test
	10	ET_Error line sensed low by Siemens contr. and Microchip
	11	ET_Error line sensed low by Siemens contr. only
	12	ET_Error line sensed low by Microchip only
	20	ET_Error line sensed high by Siemens contr. and Microchip
	21	ET_Error line sensed high by Siemens contr. only
	22	ET_Error line sensed high by Microchip only
	30	The Microchip cannot switch off the safety relay
	31	The Siemens controller cannot switch off the safety relay
	71	The combination relay doesn't get activated
	72	The combination relay is permanently activated

Error name	Nr.	Description
ERR_SELT	602	10 81 140 mA _{DC} test current not flowing in channel A
		82 ET comparator of channel A did not make safety relay trip
		83 Channel A safety relay contacts stuck closed
		91 140 mA _{DC} test current not flowing in channel B
		92 ET comparator of channel B did not make safety relay trip
		93 Channel B safety relay contacts stuck closed
		11 Channel A: safety relay or test relay contacts don't close
		12 Channel B: safety relay or test relay contacts don't close
		13 Channel A: safety relay contacts don't open
		14 Channel B: safety relay contacts don't open
		15 Channel A: test relay contacts don't open; energise relay activated or stuck and patient hooked up; AC/DC relay stuck to AC
		16 Channel B: test relay contacts don't open; energise relay activated or stuck and patient hooked up; AC/DC relay stuck to AC
		20 Electrotherapy comparator error
		1 Lower bound of channel A comparator too low, trips at 5 mA _{DC}
		2 Lower bound of channel A comparator too high, trips not at 22 mA _{DC}
		3 Lower bound of channel B comparator too low, trips at 5 mA _{DC}
		4 Lower bound of channel B comparator too high, trips not at 22 mA _{DC}
		40 REF_DAC_A outside 1.4...1.6 V range
		41 REF_DAC_A higher than 0.1 V
		42 DAC_A outside 0.9...1.1 V range
		43 DAC_A higher than 0.1 V
		44 REF_DAC_B outside 1.4...1.6 V range
		45 REF_DAC_B higher than 0.1 V
		46 DAC_B outside 0.9...1.1 V range
		47 DAC_B voltage higher than 0.1 V
		70 Channel A 2 kHz test current outside the 10...18 mA _{PK} range
		71 Channel A doesn't operate in the CC mode
		72 Channel A doesn't operate in the CV mode
		73 Channel B 2 kHz test current outside the 10...18 mA _{PK} range
		74 Channel B doesn't operate in the CC mode
		75 Channel B doesn't operate in the CV mode
		80 Channel A AC/DC relay stuck to DC
		82 Channel B AC/DC relay stuck to DC
ERR_SLAS	604	Laser therapy self test

12.3.8 Processor test (1000)

Error name	Nr.	Description
ERR_CPU	1000	

Error report form Guidance E/C

Dealer information

Name dealer:

Telephone number:

Fax number:

Contact person:

Unit ID

Serial number:

Software version:

Software version MC:

Hardware version main PCB:

Error history

Error during selftest: YES/NO

Error intermittent: YES/NO

Give an overview of the 5 last error codes:

Error number	Error code	Value 1	Value 2	Value 3

Power supplies

Measuring point:	result		Measuring point:	result
TP1 (+18V):			TP72 (-15V):	
TP11 (+15V):			TP3 (-18V):	
TP2 (+12V):			TP73(-22V):	
TP4 (-5V):			TP51(+5V):	

Error description and comments

13. Trouble shooting vacuum circuits.

13.1 General information.

The vacuum circuit has the following components:

- Vacuum pump
- Water drain tank
- Channel A valve
- Channel B valve
- Rhythm valve
- Vacuum PCB (with vacuum sensor).

The vacuum intensity level is limited in the following way:

- In continuous mode: max. 320 mbar +/- 10% (on maximum level)
- In pulsed mode : max. 480 mbar +/- 10% (on maximum level)

13.2 Check-up if vacuum is insufficient.

The vacuum levels are NOT adjustable. If a vacuum pressure measurement is not within the limits, we recommend checking the following items:

Water outlet: check whether the water outlet tube on the rear side of the unit is connected.

Pump: Open the pump (4 screws on top of the pump) and clean the membranes with normal water.

Filter: Replace the air filter.

Tubes: check whether the tubes are well connected and clean (replace if necessary).

Water reservoir: when the water outlet of the water tank is clogged, we recommend to replace the water reservoir.

If one or more vacuum cups do not remain properly attached to the patient, check if the valves or the output connectors are clogged.

If the output connectors are dirty, we strongly recommend to replace the four connectors at the same time.

♣ In order to avoid problems with the vacuum circuit, advise the end user to follow the instructions below:

Clean the patient's skin before applying the vacuum cups.

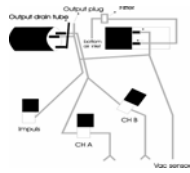
Clean the sponges after every treatment.

Use demineralised water (water without lime).

Disconnect the vacuum tubes once a week.

♣ The water tank of the Guidance E/C is smaller than the water tank of the Phyaction 787 !

13.3 Tube connection diagram.



14. REPLACEMENT PROCEDURES.

When handling static sensitive devices such as PC boards of the Guidance E/C, the following precautions should be observed:

- Persons should be earthed by means of a wrist strap.
- Ground all electrical equipment, work bench, soldering iron...

The following PCB's are installed in the Guidance E:

- Main PCB.
- ET output filter PCB.
- Vacuum PCB.
- Keyboard PCB.
- Display PCB.

14.1 Cover.

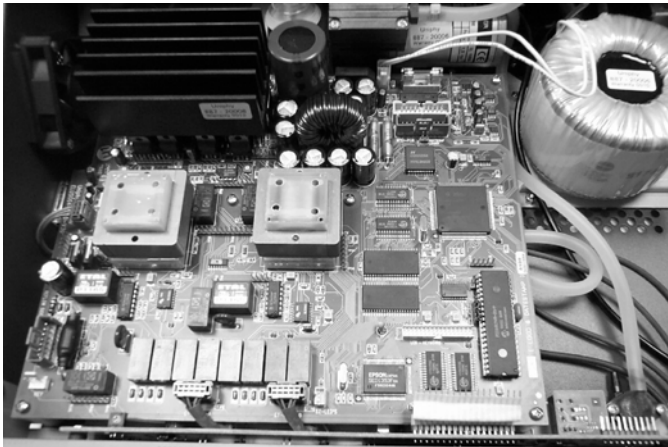


Removal: Switch off the unit and remove the mains cable from the mains entrance.
Close the display and install the unit on the side panel.
Remove 6 screws at both sides of the cover.

Caution: Disconnect the flatwire between the cover and the main PCB.

Installation: The installation is in reverse order of the removal procedure.

14.2 Main PCB.



Removal: First complete 12.1.
Disconnect the transformer (TRAFO), RS232 connector, ET-channel A connector, ET channel B connector, Vacuum PCB connector and the FAN connector.
Remove the 6 screws that fix the PCB to the chassis.
Pull the PCB a little bit forwards and take out the PCB.

Caution: To remove the vacuum PCB flatwire, put a small screwdriver under the flatwire and pull the complete cable at once out of the connector.

Installation: The installation is in reverse order of the removal procedure.
Cut the vacuum flatwire in several parts in order to put it back, or replace the flatwire.
✦ Cut the paper in a way that the internal wires stay perfectly isolated.

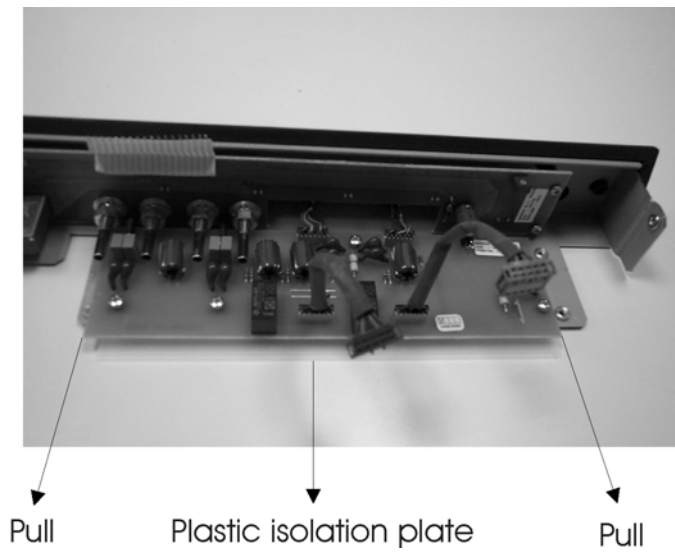
14.3 Front cover.

Removal: First complete 12.1 and 12.2
Disconnect the vacuum tubes (pull them off) and the pump connector, the valve connector and the water level detector.
Remove 2 screws on the left and right side of the cover plus 5 black screws on the bottom plate and take away the complete front cover.

Caution: Do not pull on the wires to disconnect the cables! Use a small screwdriver to lift the connectors out.

Installation: The installation is in reverse order of the removal procedure.
The tube of the vacuum sensor must be installed on the top of the sensor.

14.4 Output filter PCB.

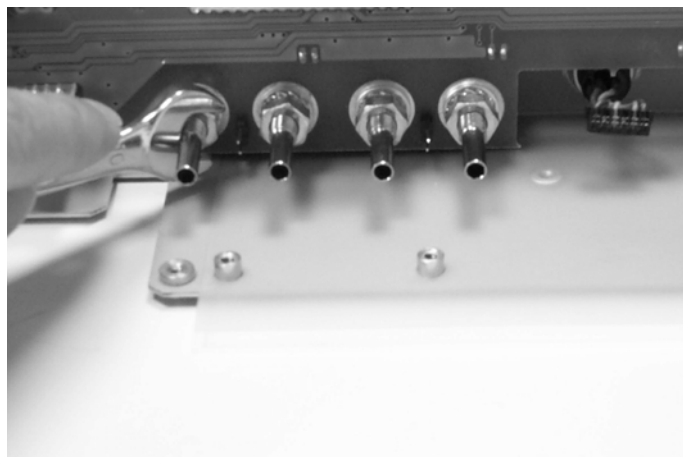


Removal: First complete 12.1, 12.2, 12.3
Remove the four screws that fix the output filter PCB onto the front chassis.
GENTLY slide the filter PCB away from the front cover.

Caution: Take the filter PCB on the corner of the PCB and don't touch the components.

Installation: The installation is in reverse order of the removal procedure.
Do not forget to install the plastic isolation plate under the filter PCB.

14.5 Vacuum PCB.



Removal: First complete 12.1, 12.2, 12.3, 12.4
Remove the 4 M10 nuts that fix the vacuum output connectors.
Remove the 2 screws that fix the vacuum sensor onto the chassis.
Remove the 4 screws that fix the Vacuum PCB to the front chassis.

Caution:

Installation: The installation is in reverse order of the removal procedure.
Make sure the front LED's fit exactly into the led holes.
Do not over tighten the screws and the nuts!

14.6 Keyboard PCB.

Removal: First complete 12.1.
Disconnect the rotary's of channel A and channel B.
Disconnect the display flatwire.
Disconnect the backlight connector.
Remove the 8 screws that fix the keyboard PCB to the front chassis.

Caution: Open the display connector with a small screwdriver before removing the flatwire.

Installation: The installation is in reverse order of the removal procedure.
Do not over tighten the screws!

14.7 Metal shield.



Removal: First complete 12.1 and 12.6.
Remove the 11 short screws plus 4 long screws of the display hinges .
Lift out the metal shield.

Caution: Do not damage the cables of the rotary's. If necessary cut off a little bit of the glue before removing the metal plate.

Installation: The installation is in reverse order of the removal procedure.
Do not over tighten the screws!

14.8 Display.

Removal: First complete 12.1, 12.6 and 12.7.
Remove the 4 black screws on the rear side of the display cover.
Gently slide out the display.
Remove the four screws of the display.

Caution: Put a soft tissue under the display assembly in order to avoid scratches.

Installation: The installation is in reverse order of the removal procedure.
Use a small screwdriver to guide the flatwire into the chassis.
Remove all the dust inside the plexi cover and on the display with a damp cloth.
Watch out: do not scratch the plexi front cover.

♣ If the black paint on the inside of the plexi front cover is scratched, use a black marker to correct it.

15. SPARE PARTS

15.1 Phyaction Guidance E/C

Unit type : PHYACTION GUIDANCE E/C incl. std.toebbeh. (115-230V)

Reference number : 114674/ 116199

Version : 10

Ordering number	Description	Service code
15519	Water outlet sealer GUIDANCE (M3x3mm black)	S
30017	Water tank assembly	S
30018	LCD screen mounted (only housing)	S
30343	PCB vacuum (front PCB)	S
30344	PCB main	S
31253	Connectorplate (plastic)	S
31258	Dose knob vacuum (plastic)	S
31260	Frontpanel 800 (topcover plastic), V1.2	S
31511	Tube watertank outlet (30cm)	S
31559	Cableassembly encoder 800	S
31561	Cableassembly output ET 800	S
31562	Cableassembly main-output 800	S
32480	Water drain connector plug 4mm	S
35705	Fuse 2A, 5X20mm, Slo-Blo	S
37224	Vacuum outlet connector chromium (1 piece)	S
30015	Mains entrance	0
30016	Silicone keypad 800	0
30643	Subfront connectorplate 800 (metal)	0
30646	Foil LCD module 800	0
30650	Foil for fan	0
30651	Bottom chassis 800, version 1.2 (metal)	0
30653	Subfront 800 versie 1.2 (metal topcover subplate)	0
31252	Led glass, 1 led, met borst	0
31256	Rear cover LCD module 800	0
31257	Knob intensity encoder	0
31556	Cableassembly backlight 800	0
31557	Cableassembly watertank 800	0
31558	Cableassembly valves 800	0
31560	Cableassembly RS232 800	0
31563	Cableassembly main-IO PCB 800	0
32479	EMC profile self-adhesive	0
32483	Friction hinge LCD assembly	0
33909	Mains tranformer, ringcore 500/800	0
34213	LED 3mm, yellow	0
34214	LED 3mm, green	0
35402	Vacuum pressure sensor Motorola MPX2050DP	0
38103	Pump 800 serie	0
38104	Fan 12V incl. connector	0
38105	Valve, 0.65mm complete	0

38404	LCD, assembly CCT, blue (800)	0
39609	Rubber foot complete	0

15.2 US head 4 cm Phyaction Guidance C

Unit type : **US-HEAD 1&3 MHz - 4 cm² PHYACTION Guidance C (892)**

Reference number : **116216**

Version : **10**

Ordering number	Description	S code
114833	Repair tool for UNIPHY US heads	S
130020	Quartz calibrated 4cm for C500/Guid C	S
131566	Cableassembly US head C500/Guid C	S
139602	Yellow protection cover for US head	S

15.3 US head 1 cm Phyaction Guidance C

Unit type : **US-HEAD 1&3 MHz - 1 cm² PHYACTION Guidance C (891)**

Reference number : **116217**

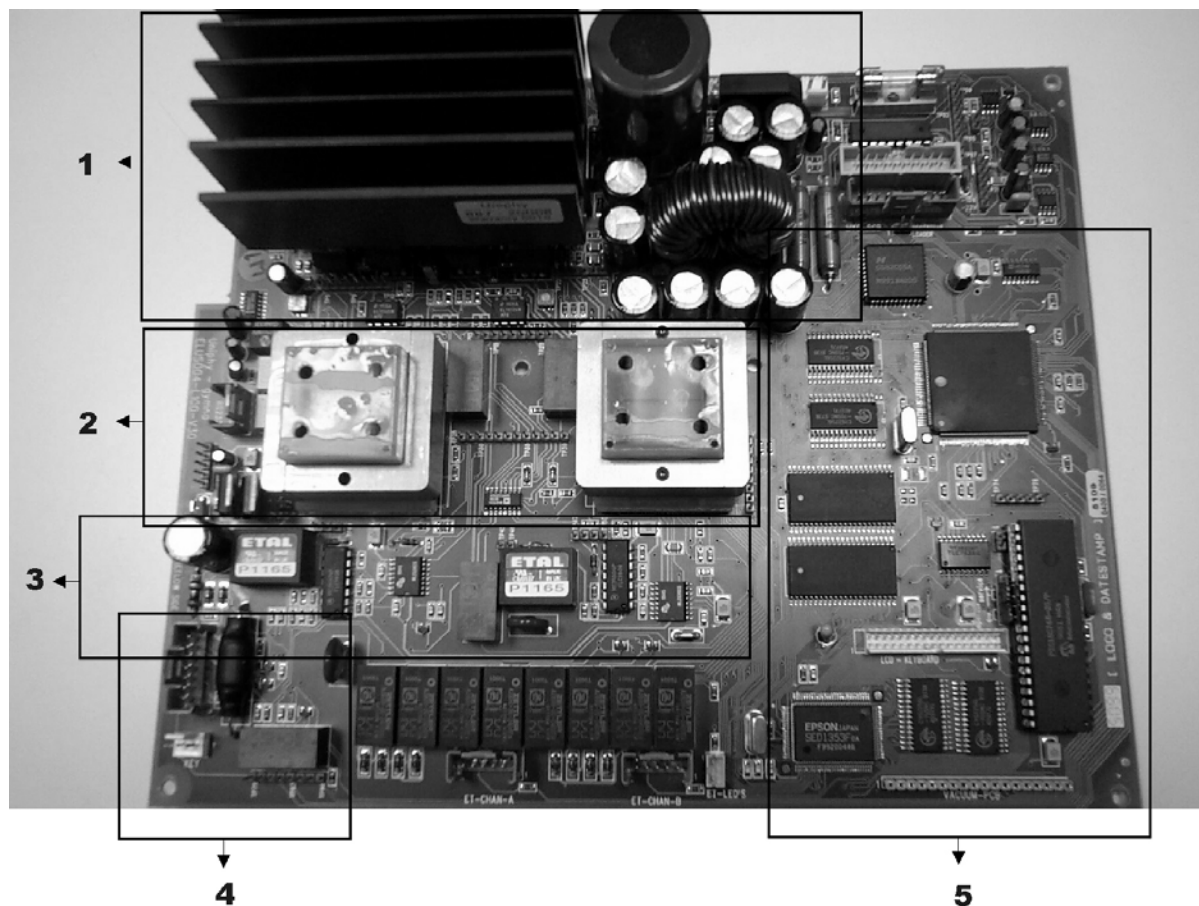
Version : **10**

Ordering number	Description	S code
114833	Repair tool for UNIPHY US heads	S
130019	Quartz calibrated 1cm for C500/Guid C	S
131566	Cableassembly US head C500/Guid C	S
139602	Yellow protection cover for US head	S

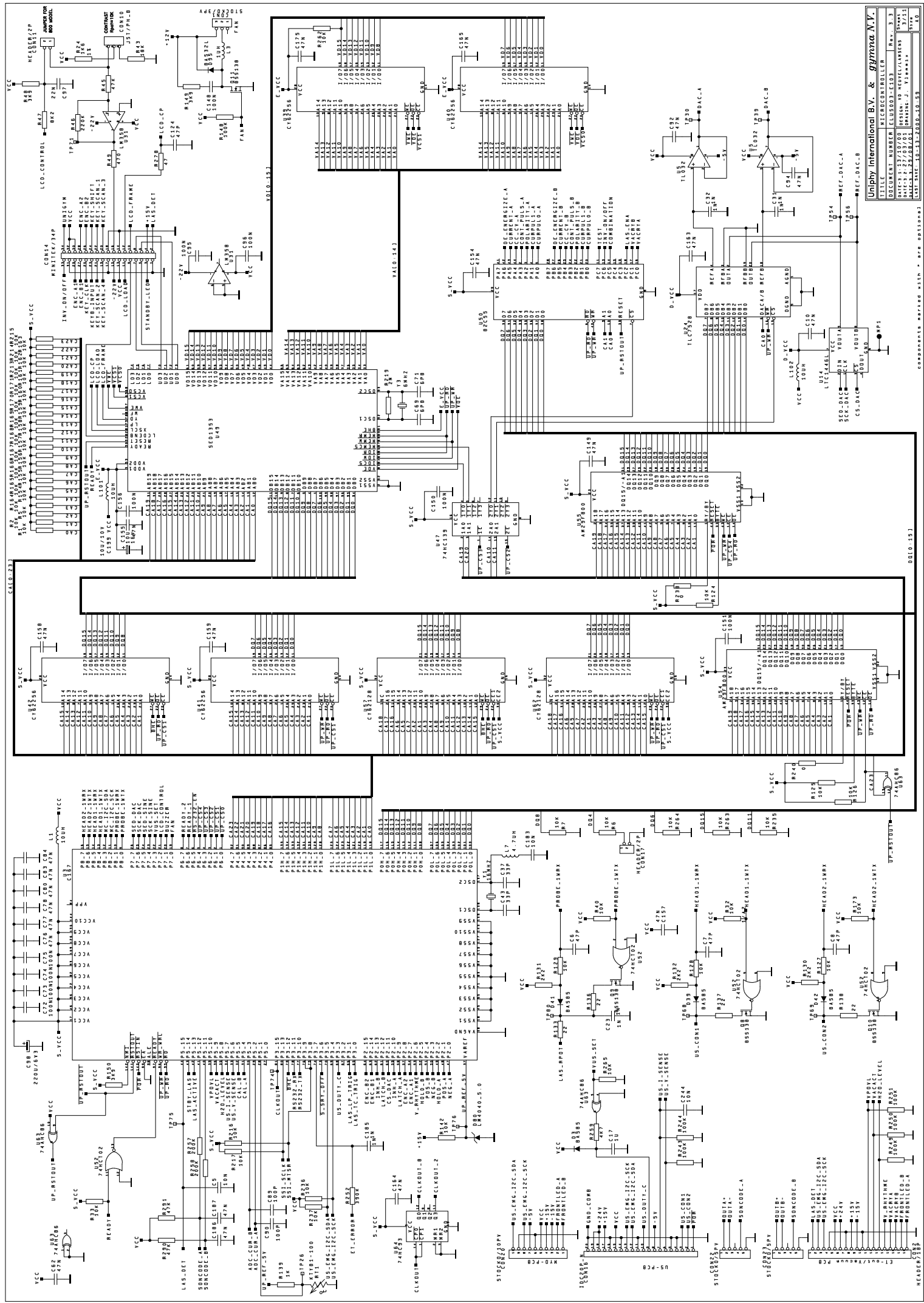
16. SCHEMATICS

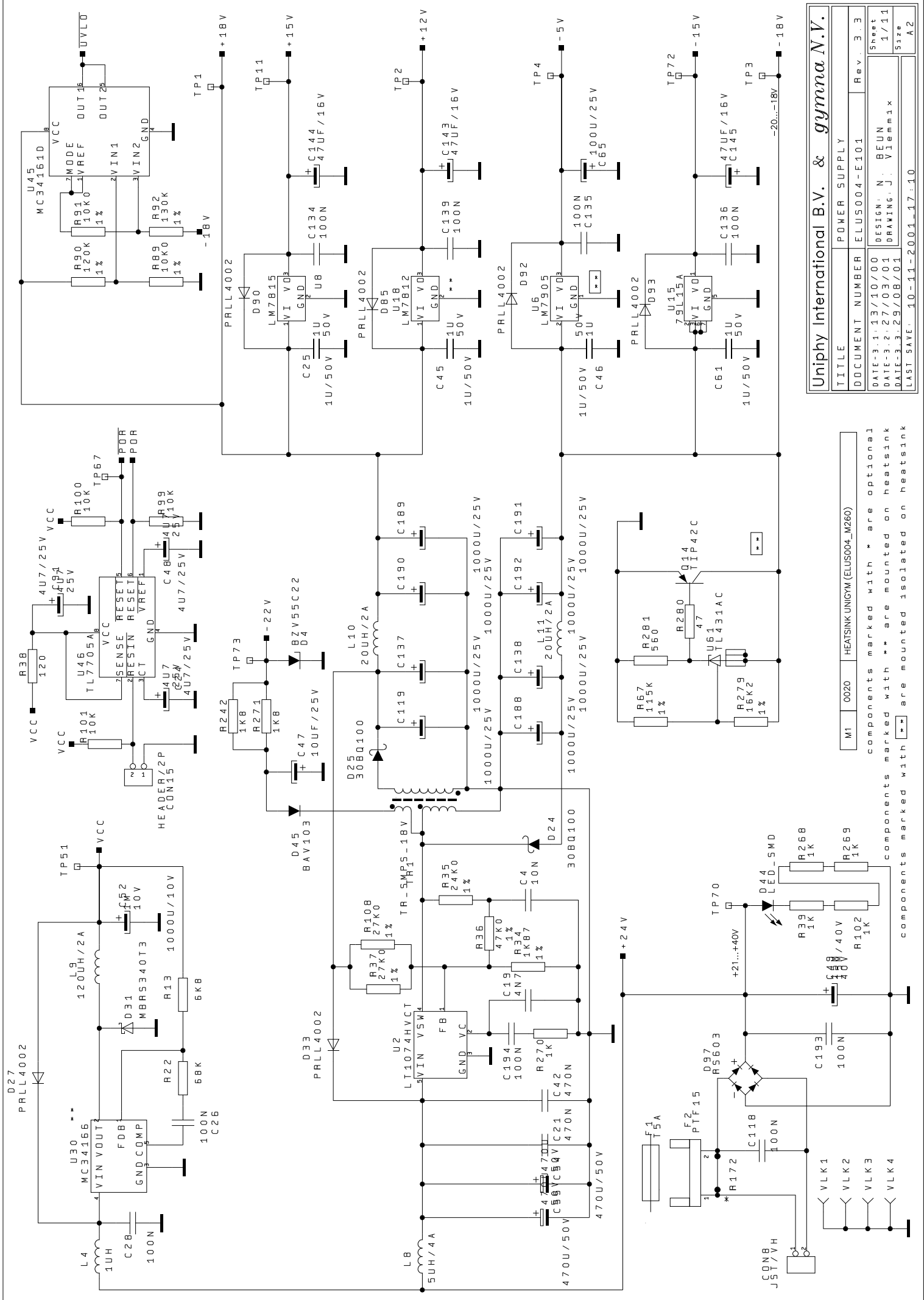
1. Layout main PCB with indication of important points.
2. Photo main PCB divided in groups.
3. Power supply schematics
4. Microcontroller circuits.
5. Safety control circuits.
6. Relais circuits.
7. Amplitude generation circuits CH A.
8. Amplitude generation circuits CH B.
9. Output circuits CHA.
10. Output circuits CHB.
11. Current measuring circuits.
12. RS232 and EEPROM circuits.
13. Vacuum control circuits.
14. Ultrasound circuits

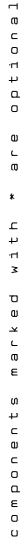
Main PCB

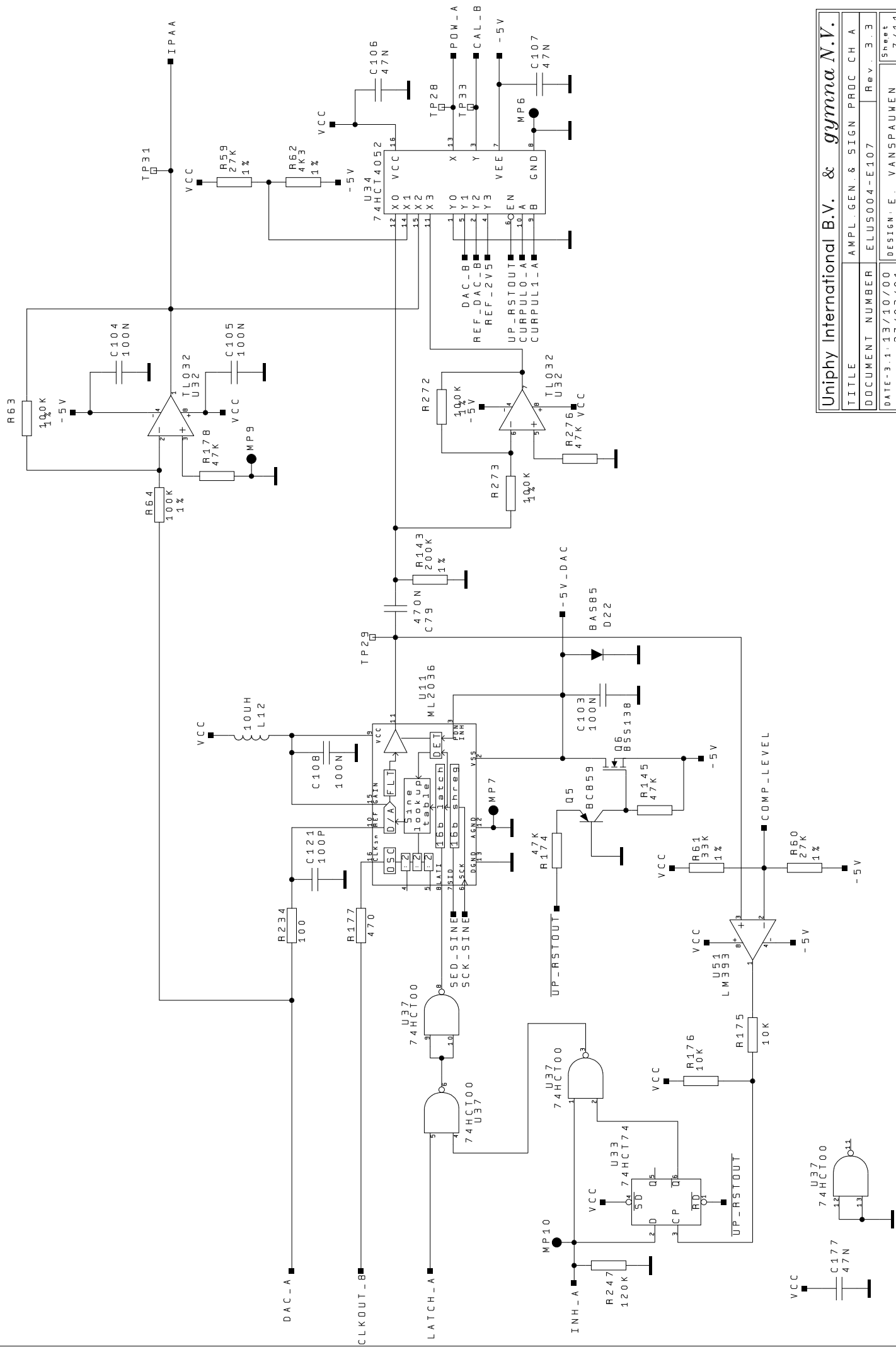


1. Power supply and amplifier transistors.
2. Output transformers.
3. Current measuring circuits.
4. Laser circuit (not in use for Guidance E/C).
5. Microcontroller circuits.

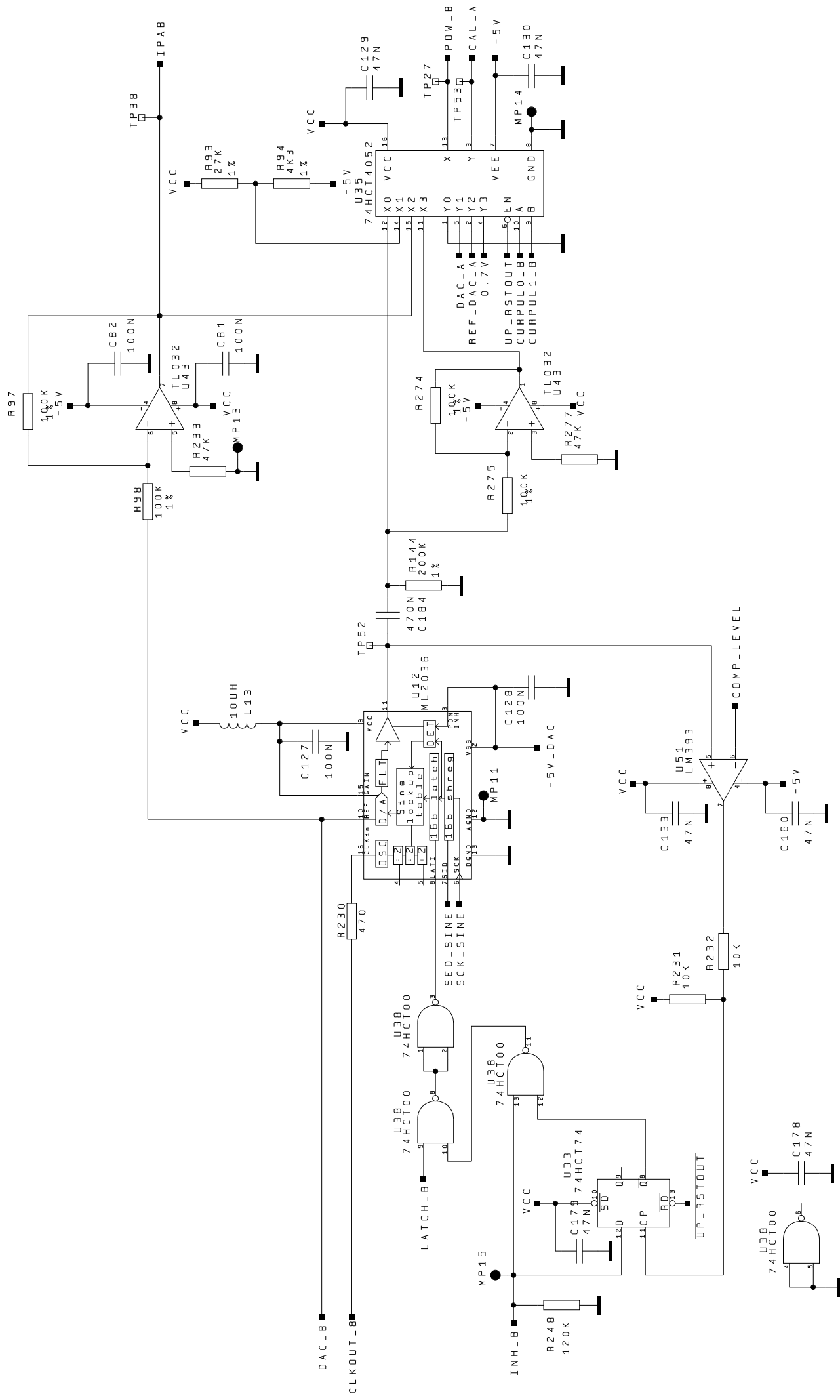






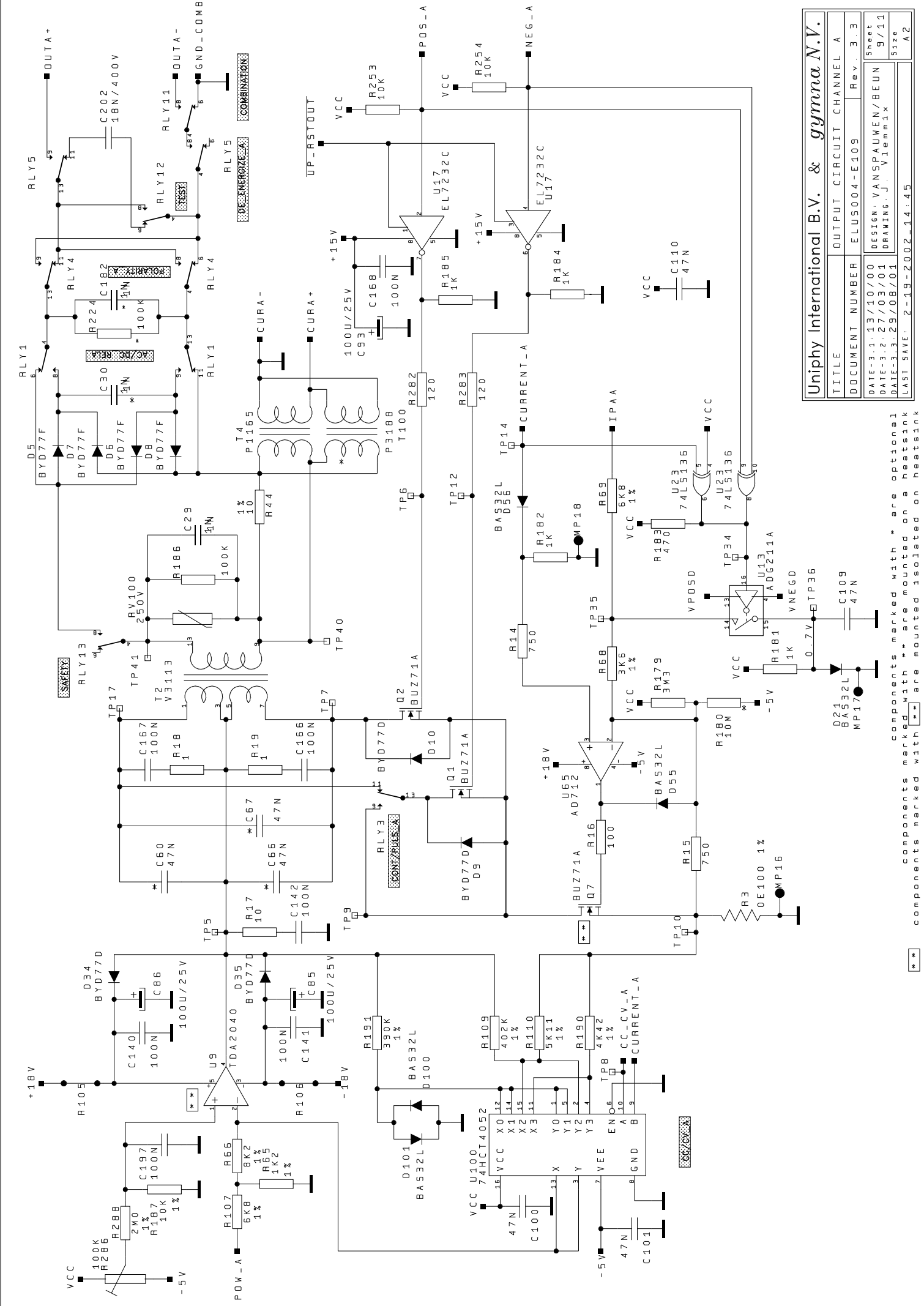


COMMENCED STAFFED WITH * ARE OPERATIONAL



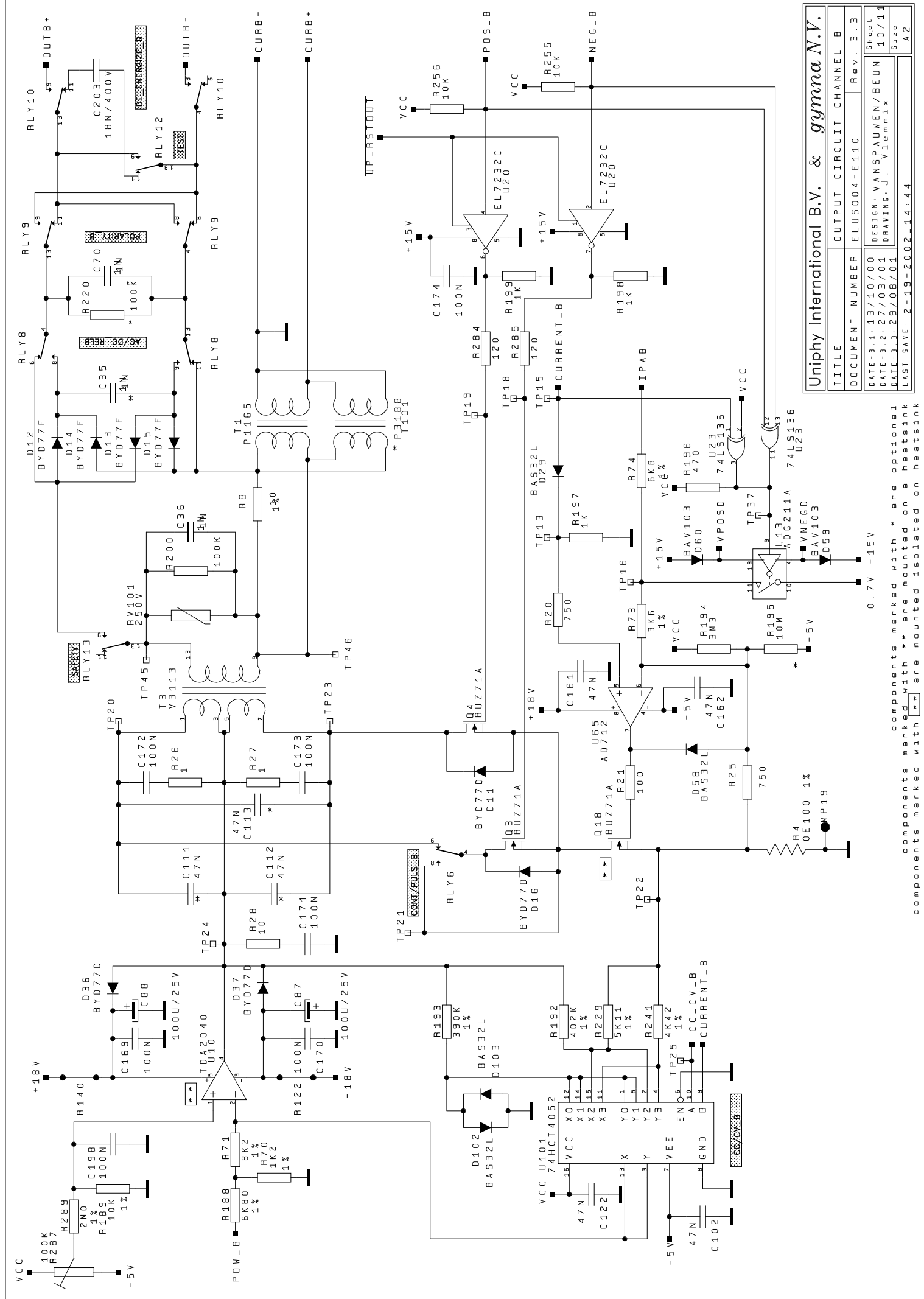
Uniphy International B.V. & gymna N.V.			
TITLE	AMPL.GEN & SIGN.PROC.CH B	Rev.	3.3
DOCUMENT NUMBER	ELUS004-E108	Rev.	3.3
DATE-3.1.13/10/00	DESIGN: E. VANSPAUNEN	Sheet	8/11
DATE-3.2.27/03/01	DRAWING: J. Vlemm1x	Size	A2
DATE-3.3.29/08/01	LAST SAVE: 6-4-1999_14:27		

components marked with * are optional



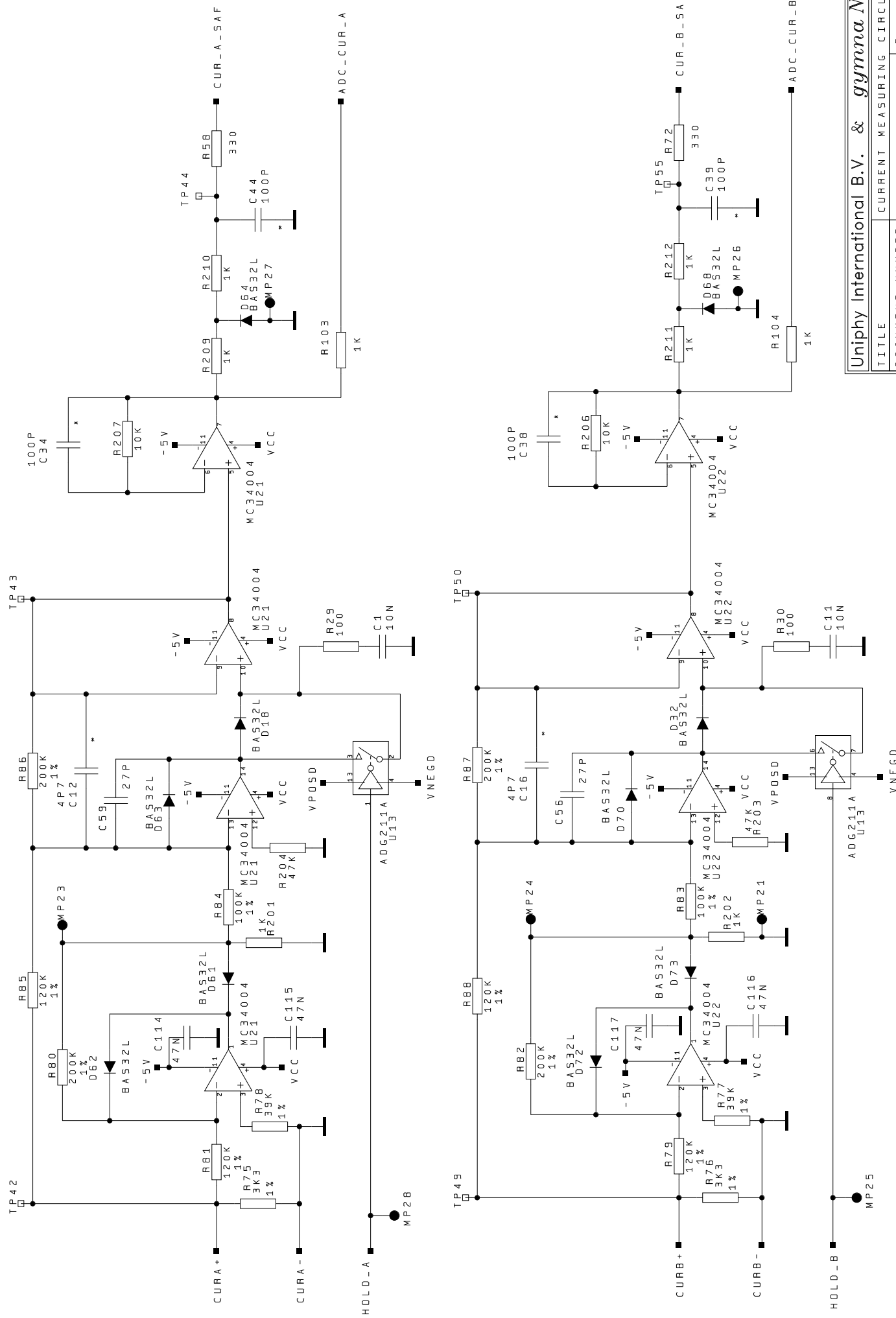
Uniphy International B.V. & gymna N.V.			
TITLE	OUTPUT CIRCUIT CHANNEL A	Rev.	3.3
DOCUMENT NUMBER	ELUS004-E109	Rev.	3.3
DATE-3.1.13/10/00	DESIGN: VANSPAUNEN/BEUN	Sheet	9/11
DATE-3.2.27/03/01	DRAWING: J. Vlemmix	Size	A2
DATE-3.3.29/08/01			
LAST SAVE: 2-19-2002_14:45			

components marked with * are optional
components marked with ** are mounted on a heatsink
components marked with ** are mounted isolated on heatsink



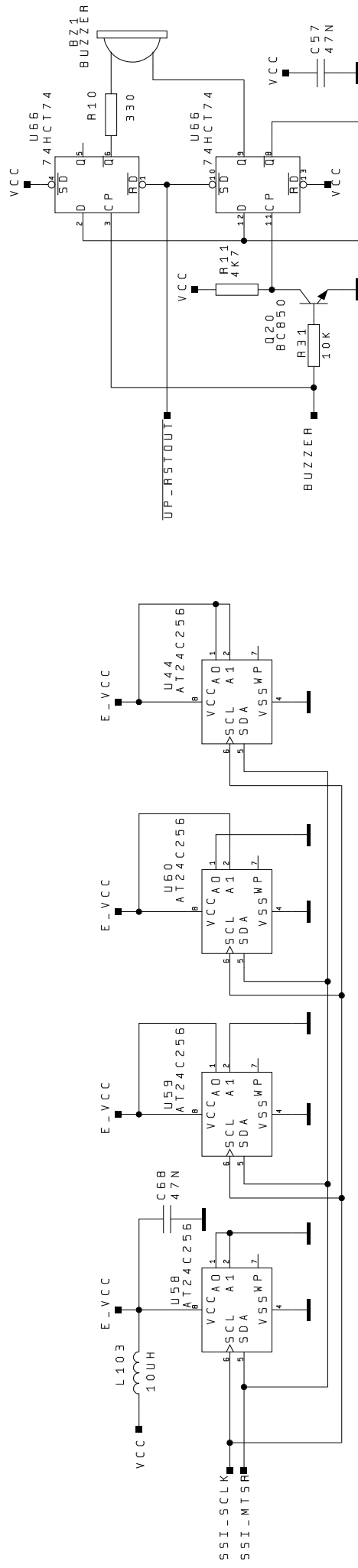
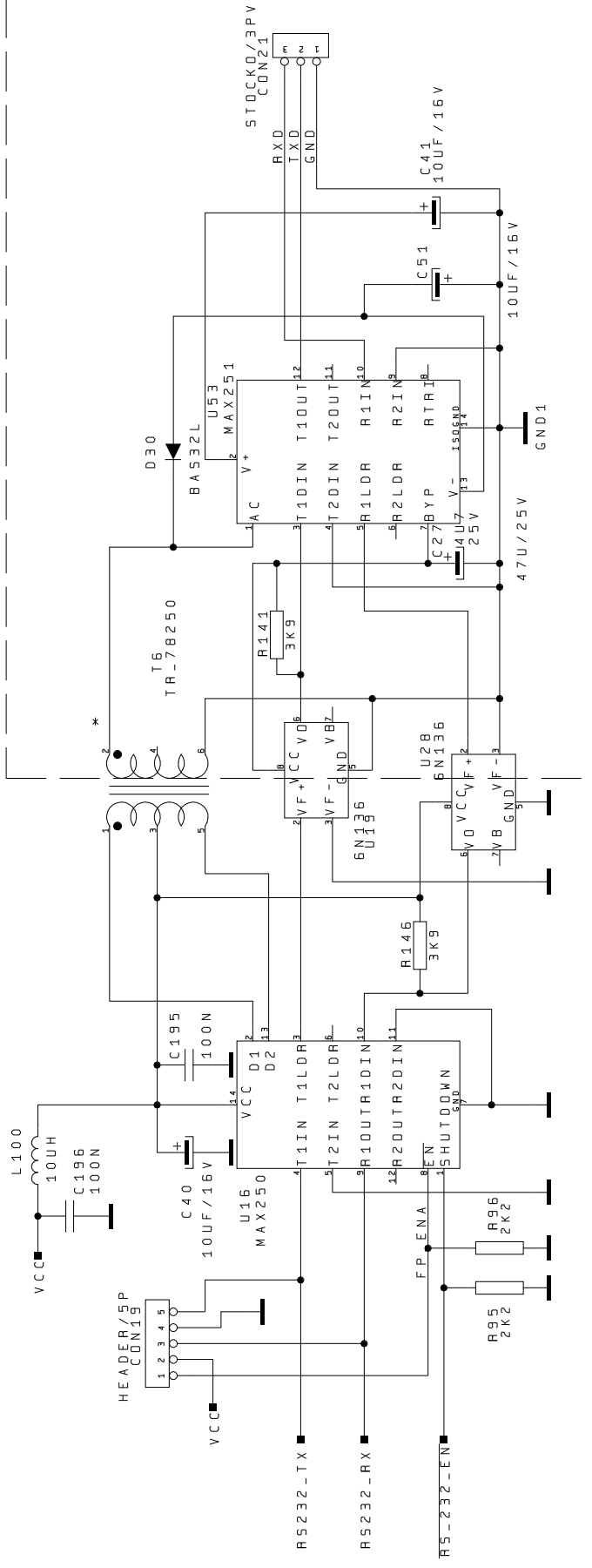
Uniphy International B.V. & <i>gymna N.V.</i>			
TITLE	OUTPUT CIRCUIT CHANNEL B	Rev.	3.3
DOCUMENT NUMBER	ELUS004-E110	Sheet	10/11
DATE: 3.1.13/10/00	DESIGN: VANSPAUWEN/BEUN	Size	A2
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DATE: 3.3.29/08/04	LAST SAVE: 2-19-2002_14:44		

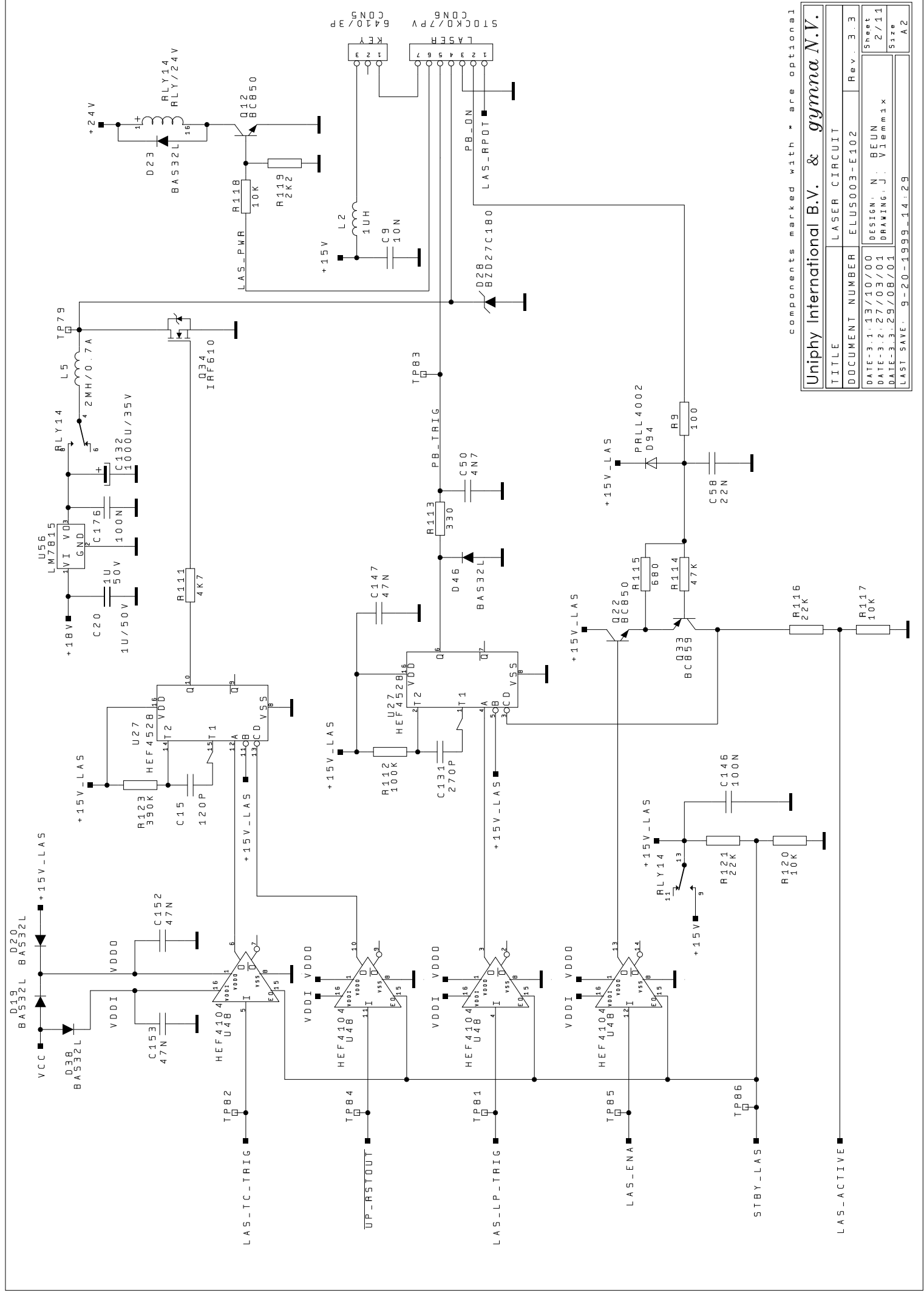
components marked with * are optional
components marked with ** are mounted on a heatsink
components marked with *** are mounted isolated on heatsink



Uniphy International B.V. & <i>gymna N.V.</i>			
TITLE	CURRENT MEASURING CIRCUIT	Rev.	3.3
DOCUMENT NUMBER	ELUS004-E106	Rev.	3.3
DATE-3.1.13/10/00	DESIGN: E. VANSPAUWEN	Sheet	6/11
DATE-3.2.27/03/01	DRAWING: J. Vlemm1x	Size	A2
DATE-3.3.29/08/01	LAST SAVE: 9-20-1999_13:54		

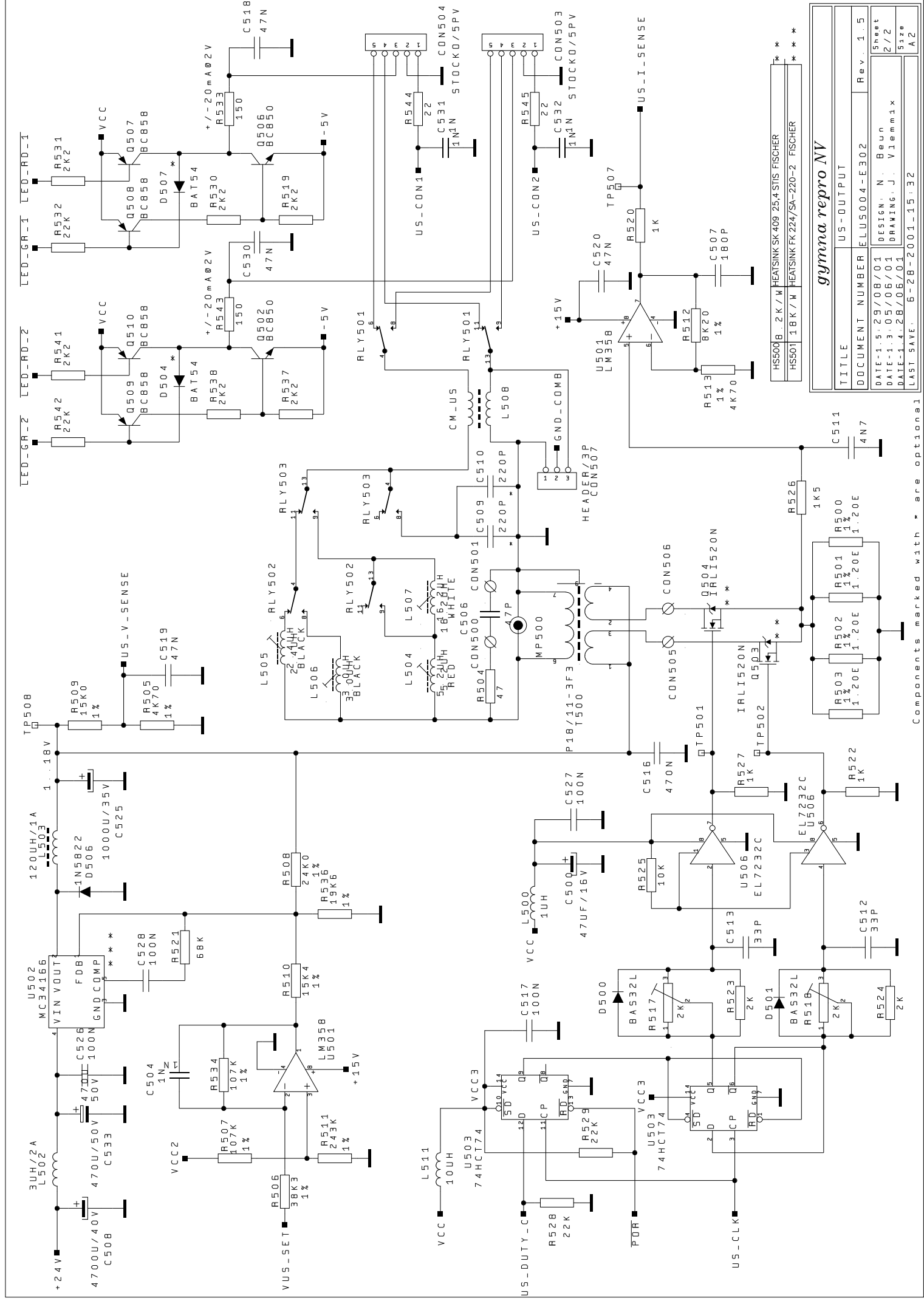
components marked with * are optional



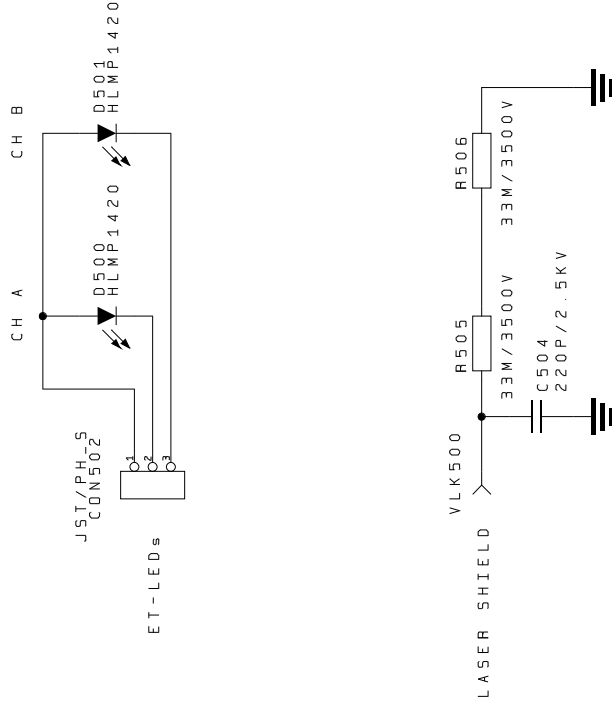
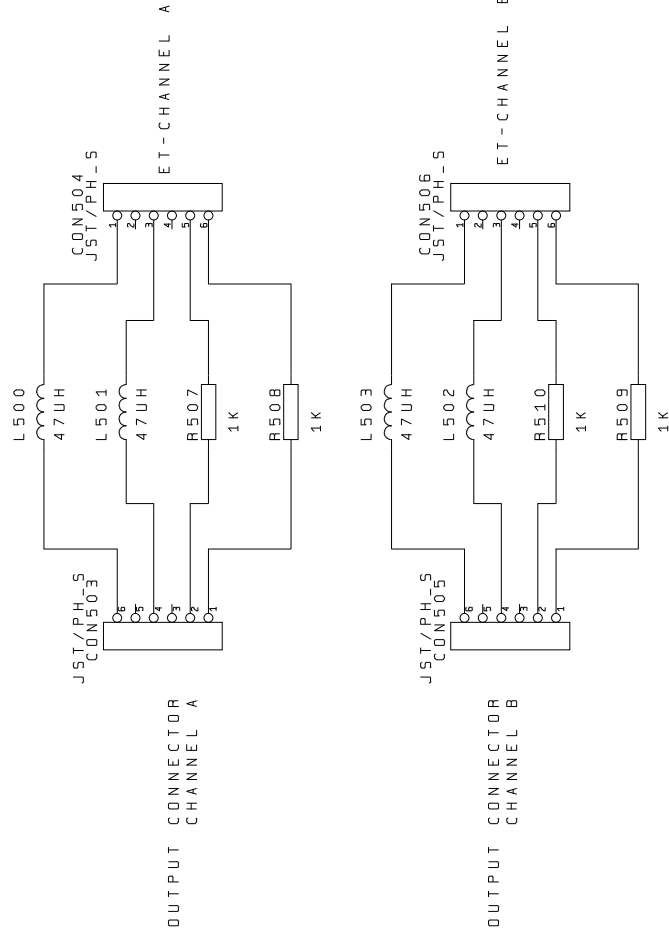
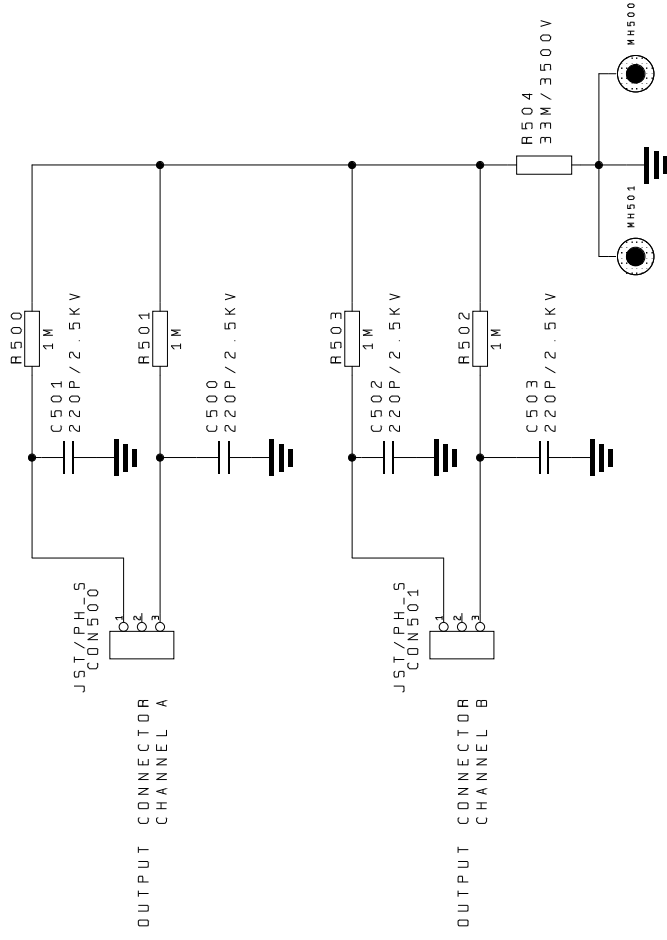


components marked with * are optional

Uniphy International B.V. & <i>gymna N.V.</i>		
TITLE	LASER CIRCUIT	
DOCUMENT NUMBER	ELUS003-E102	Rev. 3.3
DATE-3.1.13/10/00	DESIGN: N. BEUN	Sheet 2/11
DATE-3.2.27/03/01	DRAWING: J. Vlemm1x	Size
DATE-3.1.29/08/01	LAST SAVE: 9-20-1999_14:29	
A2		



SECRET * R F X P E K E S T C O D E C O J



M501	0020	LEDHOLDER MAH404 (FISCHER)
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components marked with * are optional

<i>Signature for agreement</i>			
	<i>Name</i>	<i>Signature</i>	<i>Date</i>
<i>Review Moderator</i>			
<i>R&D Manager</i>			

gymna repro NV			
TITLE		ET OUTPUT PCB	
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